MSc Program
Environmental Technology & International Affairs

Derivation of Finance for Improved Waste-to-Energy Technology: Developmental Policy Research and Methodical Financial Analysis to Catalyze Sustainable Development in Delhi, India

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by
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Vienna, 30.03.2016

Affidavit

I, **Marissa Joanna Davis**, hereby declare

1. that I am the sole author of the present Master's Thesis, "DERIVATION OF FINANCE FOR IMPROVED WASTE-TO-ENERGY TECHNOLOGY: DEVELOPMENTAL POLICY RESEARCH AND METHODICAL FINANCIAL ANALYSIS TO CATALYZE SUSTAINABLE DEVELOPMENT IN DELHI, INDIA", 64 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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Abstract

What fiscal policies do or do not lend credence to the concept of sustainable development? Conceptually development labels often serve to define the socio-economic progress of a nation to further influence appropriate political policy. Policy making regarding sustainable development on a national and international level is inconsistent with the current standard of growth policies within India. Current growth policies represent a systematic strategy for growth that do not always incorporate sustainable development principles. An examination and study of the National Capital Territory of Delhi will be conducted to find evidentiary data of sustainable development potential. Investigating history following 1980 and analyzing current data will be used to identify the core issues within achieving sustainable development. To rectify the hindrances to Delhi's sustainable development data analysis will support expanding better technology Waste-to-Energy incineration projects through calculating a subsidy financed by revenue from a developmental income tax.

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1. Introduction

The publication of the Brundtland Report (1987) by the United Nations gave rise to the principle of "Sustainable Development" and began a corresponding environmental movement by Western Nations. Subsequent to these maneuvers in international politics to implement this principle, were foundations germinated firstly at the Earth Summit (1992) in Rio de Janeiro, Brazil. The Earth Summit's foundations stemmed from the Stockholm Conference on the Human Environment (1972) which introduced the idea of pollution in air and water quality in the environment. The later born Rio Declaration on Environment and Development (1992) listed 27 principles to guide a future for sustainable development.

Despite popular belief there is no growth model for a country labeled as developing. There is however generally accepted principles that are frequently applied to a nation trying to accelerate its economic growth. Sustainable development has its own set of unique principles defined within the Rio Declaration that can be compared and contrasted with the growth strategies of large developing countries today. The two sustainable development principles not currently taken into consideration when advising economic development and growth are principles three and five. Principle three of the Rio declaration states "The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations." (UNEP, n.d.) The global climate crises and especially localized environmental crises of some of the fastest developing nations has made it apparent that the needs of clean environment and plentiful resources may not be available for the upcoming generation and those thereafter.

The second principle that is inconsistent with current development strategy is principle five of the Rio Declaration, which states "All States and people should cooperate in the essential task of eradicating poverty as an indispensable requirement of sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world." (UNEP, n.d.) Here it is stated that sustainable development emphasizes economic growth as codependent with the elimination of wealth disparity. This idea has become difficult today as wealth disparity is treated as a consequence to development rather than a symptom of unsustainable development. Wealth

disparity becomes perpetuated not only generationally within a country but as the lower classes of a nation remain in poverty and do not undergo gains relative to national country growth, then the disparities between supreme wealth in high income countries and poverty in lower income countries creates an international widening income gap.

The usual assessment of national development evaluates GDP or GDP per capita, which estimates an overall growth trend while not accounting for alterations to the income gap or the environmental true costs of growth. The exclusion of these principles when assessing development status has made it inherently difficult to enact policies that can rectify climate damage.

One of the most influential legally binding climate conventions the UNFCCC (The United Nations Framework Convention on Climate Change) provided the foundation, which led to the later adoption of the Kyoto Protocol (1997). The Kyoto Protocol included the first attempts to legally bind parties to emissions targets, which would reduce global greenhouse gases. These have all made up the historical string of what shapes the international environmental political forum of today. The culture of shaping these mandates involves continuous negotiation by the world collective in order to protect the environment while ensuring universal economic development that does not disfavor the needs of the developing— and least-developed nations.

Overlooking wealth distribution in international politics has been a barrier to sustainable initiatives during negotiations like that of the Kyoto Protocol. It is a prevalent assertion that the wealth of many nations, India being a commonly discussed one, is not great enough to be able to impose the expense of clean initiatives. A nation like India is viewed by its GNI per capita at 1,570 USD annually (World Bank, 2014,) which is considered low by wealthier nations. This number does not reflect however the size and magnitude of the upper income bracket. The politicians of nations in India are using the same data and often align themselves during negotiations with nations of similar economic circumstances to maintain the status quo for their economies. Furthermore, as economies transition overtime, the socioeconomic reputations start to become inconsistent with the current country statuses and potential, leading to the over-assumption of poverty.

The political claim that nations like India are too disadvantaged to develop sustainably has become a rhetoric based on the association of India with poverty, but is not substantiated by accompanying economic data. Much of this is based on history. Some of the history being colonial, India and many nations of similar circumstance are hesitant to be politically dictated to. On the other hand, much discussion in politics is rhetorically invalid presumptions on what sustainability means and how it can inspire a country positively while not interfering in growth. At some point sustainability became synonymous with expense. The question then becomes, is it an expense or an investment? The point of view of this paper is that it is an investment and if we're working with that assumption then what needs to be answered is whether the investment requirement for sustainable growth is available.

An additional type of categorization for countries is through relative level of income. The United Nations or the World Bank would classify India as a "Lower-Middle Income Country." The GNI per capita at $1,570 USD annually (World Bank, 2014.) Income classification is not in complete correspondence with development status. For example Saudi Arabia is labeled as a "High-Income Developing Country" (United Nations, 2012) because of the financial means. However, because of social politics they are considered developing and under international political definition would not be mandated to do environmental spending. The financial strength of a high income nation is indisputable, while in a lower middle income country like India further investigation will determine if they are withheld from investing because of accurately placed financial development labels or if they too fall under the same contradiction. The lines are often blurred between development status and financial resource where data is needed to support the current growth models.

The population dynamics of India include individuals ranging from the super wealthy to the very impoverished. In a country where extreme wealth exists the dynamics of wealth disparity can point to excessive finance where extreme poverty also exists. To support the economic claims the poverty status of a nation must not only be assessed but the financial measurability as well. If analysis shows that funding from the upper wealth

bracket is sufficient enough to cover the costs towards sustainable development, this can set forth new sustainable growth strategies not just for Lower-Middle Income Countries but nations earning above and beyond as well.

India is one of the foremost examples of a country that has experienced increased gains in GDP over the last three decades. The prosperity of India arose from three decades of technological, industrial and business investment. With this growth from a combination of different growth strategies brought an increased wealth paired with increased negative environmental and health externalities. The prowess of the Indian market has created a positive international reputation in the global economy while simultaneously large scale environmental and water improvement issues have gone unaddressed and remain well known.

The legitimization of the need for increased environmental solutions should in principle come from the people. As it is the government's duty to work for the people, if people express a demand for cleaner energy and a cleaner environment, if the ability exists the government should meet these demands. The most direct way to determine if the desire for clean initiatives exist and the finance to support them, is to ask nationals if they want to contribute their tax-dollars towards the finance of clean initiatives. A salaried worker's ability to express what they can afford and what they choose to spend their tax money towards is data that can be beneficial to decision making opposed to predicting expected desire and affordability based on anecdotes regarding development.

This paper will explore economic development history and examine what policy falsehoods have made negative impacts on India today. The discovery of what has institutionalized a disconnect between economic and sustainable development policy will provide an opportunity to connect these policies. The method utilized will be the calculation of annual sustainable investment revenue from income tax in the National Capital Territory of Delhi and the recommendation of project design and policy measures towards making a sustainable impact. The national and international political implications of sustainable growth potential will suggest the best political course for Delhi and India's sustainable development future.

"Once you label me you negate me." – Søren Kierkegaard

2. Sovereign Growth & Development Policy Post 1980's

The international community in global environmental politics has come together on many occasions to try and fight environmental crises. Nations have been slow to act and in the international political realm. Past colonized countries and current superpowers have made political negotiations a fight for sovereignty. Eastern nations defend themselves against the undue influence of the West's demands on the East to this day. The past and present dominance of the West in the politics of other countries has made the basis for national compromise difficult.

When we think about the definition of what it is to be sovereign, based on circumstance and history you would likely find that there is no singular perception of what it means to be sovereign. One expert points out some of the sources of confusion for the political mind-set of different sovereign states:

> Are there differences in what sovereignty has meant for states whose organized existence is largely a product of colonialism? Does the territorial basis of the state differ fundamentally in frontier societies or in multi-ethnic ones? Clearly the answers are unlikely to be uniform across time and for all states. This suggests that we cannot describe in universal terms either the processes in rendering states sovereign or the way in which they may be changing as a result of ecological interdependence. Sovereignty as a global institution changes because of what happens to different states over time, at different rates and in different ways. (Conca, 2014: 100)

It is clear that frontier societies i.e colonial countries and post-colonial societies have different expectations of each other based on their own perceptions of sovereignty. Based on history, the post-colonial states have their perception as to what defines them as sovereign. They have demonstrated in subsequent actions that express their sovereignty e.g. by manifesting their own future and not letting frontier societies dictate their ecological politics.

In specific cases of international climate and sustainability negotiations sovereignty arises through complex tactics of alliance building pairing nations together of similar development to gain individual independence, more specifically the nature of the Annex protectorate grouping under the Kyoto Protocol. The largest grouping, the G-77, involves several Eastern, Latin American and Island nations. The non-Annex nations constituents are of primarily Western countries representing the other main group. The West would like

the non-west to cut the extraordinary emissions they have created. Meanwhile the non-West would like the West to cut most emissions since they have the most longstanding history in the creation of pollution. The G-77 essentially represents a non-western stronghold of countries bound together under the Annex of the Kyoto Protocol to shield them from climate reparations. Implicit in these negotiations remains a black and white fallacy that the debate should focus on one or the other without finding the grey of compromise.

The sovereignty stronghold has also led to individual nations not being able to represent their individual climate desires but the desires of the Annex as a whole. Many of the nations within the G-77 share no climate commonality. Latin American and Island states share the goal that they want to see a large cut to global emissions because of their easily affected rich ecology and low proportional emissions output. However, they are bound together under the Annex with the highly pollutant countries of India and China in the G-77. Emission cuts within China and India are a significant factor in achieving the aims of the rest of the group however the group in entirety maintains a position of maintaining the status quo. The individual aims of many and the global aim of one being secondary to the sovereignty aims of former colonists versus former colonies.

Conca expands further into a theory by Robert Jackson when looking at states. There comes the question of a nation-state's sovereignty as being "a norm or a fact." The question is posed, whether sovereignty is "based on the 'fact' of material capabilities that enable organized entities to claim standing as states? Or is it based on the selective extension of recognition as a legitimate state?" (Conca, 2014: 101) The solution in global politics is that individual nations should honor their international contracts. A failed state would be an example of a sovereign nation existing based on the norm while the government cannot safely organize the collective. This extreme case shows how a nation with the entitlements of sovereignty can fail the people of the nation. If a failed state made progress with initiatives such as government organizing and eliminating corruption while promoting growth, job creation and infrastructure then this state is legitimized and holds greater influence in the global collective based on its factual sovereignty and not its

normative. If India progresses in several socioeconomic areas but regresses environmentally, in this area their sovereignty loses legitimacy.

The other perspective that needs to be adjusted is the idea that "ecology-erodes-sovereignty." (Conca, 2014: 101) The notion is that if you persuade a nation to alter their national ecology you erode the sovereignty of that nation. Political pressure exists in all realms of politics, yet when it comes to national ecology the common viewpoint is that ecological pressure is threatening. This is linked to the historical colonial assault on resources and exploitation of lesser economies i.e. using another nation to benefit your own. The demonstration of sovereignty became the politics of inaction when in reality a state only improves when it demonstrates its ability to protect its natural resources. An illusion of international prowess is created while national conditions grow ever more insecure for the internal environment in high pollutant countries and global environment as a whole.

The cultural politics involving the allowance of stark pollution for developing nations derives from the implication that non-Western nations are economically too weak to develop sustainably. Even within India's post-independence exists longstanding poverty and financial crises that reinforced an even greater aversion to economic change. The capability to be financially independent and grow exists. The economic truth of the presupposition that a nation like India does not have the spending power to improve environmentally may not be entirely correct. The data and information used to make this assessment may be outdated and inconsistent with the current economic state of India, or even more specifically Delhi.

India experienced rapid growth that many economic and political prognosticators attributed to the market liberalization begun in the early 1990's. This market liberalization contributed to growth within India and remains one of the major financial catalysts of today. However, the actual growth trend of annual national increases per capita of 22-23 cents per annum began in early 1980 and has maintained at the same rate of increase since then and now a decade later. (Kohli, 2006: 1,254.) The combination of foreign finance, increased exports and lower tariffs have been the accepted development method for India

today. If you look at GDP growth purely as a determinant like many political economists today, you would find that between 1980-1990 that industrial growth, investment growth and GDP growth was slightly to reasonably higher than the years following shown in (figure 1.) When examining the source of this growth during this earlier period signs can point to internal efforts that India was capable of growing despite the current argument today that they cannot grow internally. Their sovereignty is being undermined by speculation.

Before the sweep of pro-market policies in the 1990's India of the 1980's employed a more pro-business growth strategy called "growth first" founded by Indira Gandhi (Kohli, 2006: 1,256.) The distinguishing factor of a pro-business versus a pro-market policy is that a pro-business policy is an internal initiative, versus the type of pro-market growth perpetuated by multilateral market interactions. The successful growth outcomes that arose from the pro-business growth of the 1980's is one of the inconsistencies with international policy on the capacity for India to internally drive their own development through spending. The history does not highlight failure in the idea of internal spending, particularly development spending but illustrates the necessity of maintain a positive trade balance while making financial investments. The "growth first" model is an example of a sovereign initiative by India that established a faster rate of growth and nurtured some of the most flourishing companies of India still in existence today. Yet there is some apprehension, mainly because of the 1980's that hinders the courage to take internal action today.

This internal strategic form of development jumpstarted prosperity within India but also inspired some of the greatest fears in development decision making of today. All nations need to reassess their concern for wealth inequality and environmental degradation because of the misconception that these two preeminent characteristics are mutually exclusive with growth. The wealth inequality and environmental crises of India and particularly in Delhi create tension between deviating from or remaining with the status quo of investment strategy.

Basic Growth Data in India 1950-2004 (% per annum)					
	1950-1964	**1965-1979**	**1980-1990**	**1991-2004**	**1980-2004**
GDP Growth	3.7	2.9	5.8	5.6	5.7
Industrial Growth	7.4	3.8	6.5	5.8	6.1
Agricultural Growth	3.1	2.3	3.9	3.0	3.4
Gross Investment/GDP	13	18	22.8	22.3	22.5

Figure 1: Basic Growth Data in India (Economic and Political Weekly, 2006)

3. Principle Five: Wealth Inequality

India is often identified by its stark poverty while its superior wealth goes overlooked. Since India does contain these two extremes of poverty and wealth, India is a nation that can be categorized by very high wealth inequality. Wealth inequality has grown in the last decade to proportions unfavorable to the poor. (Chart 1) indicates that the share of wealth of the top 10% within India pushes the threshold of controlling nearly 80% of total wealth.

This wealth inequality predominantly occurred over the last two decades' when the income gap in India doubled in size. India's great wealth inequality led to two phenomena very unique to India. First, India is categorized by high informal employment (TNN, 2011.) Informal jobs are untaxed and receive the lowest form of wages for goods, services or labor. These employees are essentially off of the formal economic grid yet constitute important roles in the total economics of India. These jobs can be in industries like construction, where in many countries it is a formal occupation whereas in India the

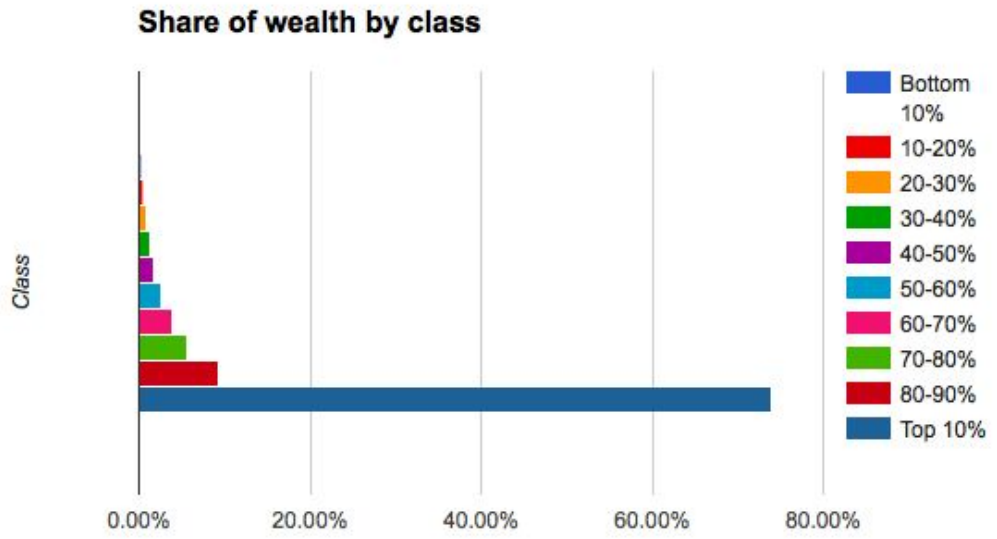


Chart 1: Share of Wealth By Class (The Hindu, 2014)

salaries for these positions are low compared to taxable salaries elsewhere and remain unmonitored. The second phenomenon is disguised unemployment, which are jobs created without necessity for the the purpose of subsistence. These jobs can be considered a form

of generosity from the wealthy class. In this case however the system of employment places employees in a role or function that does not create growth or fulfill the demands of the Indian economy. The employment of these individuals is important and salaries can be high enough to be taxable, however the duties are non-select in that these jobs do not fulfill any strategic function. The wealth channeled to these laborers supports a growing class not based on long-term investment growth but immediate disposable income.

(Chart 2) points out global trends in the rise of wealth, especially net worth over the globe. At face value this graph gives a positive perception of the ability to maintain global economies. There has been positive growth with positive outcomes. One must be discerning when they derive the implication of overall USD per adult within this graphic. Firstly, this is an average and does not indicate the equitable rise of a population nationally or globally. To give greater perspective when looking at India, figures show that within India 46 individual billionaires are 10% of the total GDP as of 2012 (BBC, 2012.) The population of India in 2012 was at 1.237 billion people (World Bank, 2012.) Essentially 1.191 people in 2012 had zero share in 10% of the GDP, meaning this 10% was controlled by .0000037% of the population. As mentioned earlier average incomes in India range between $1,000-$2,000 USD. Upon second glance at the graph the rapid growth globally and within India underlines growth funded by a very small percentage of the population.

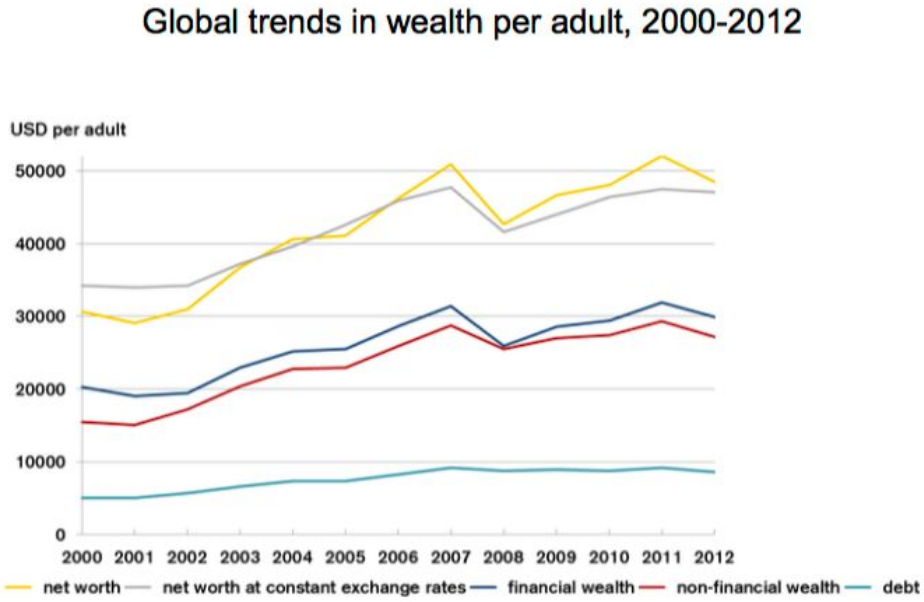


Chart 2: Global Trends in Wealth per Adult 2000-2012 (The Hindu, 2014)

In an even a clearer picture of the wealth disparity in India, (chart 3) shows the controlled share of wealth by the top 10% of the population. What is shown is that 74% of the wealth in India as of 2014 was controlled by the top 10%, this number includes the 46 billionaires of India. On further examination in India of the top 1% this group controls an above average amount of national wealth relative to other economies. At the same time even with this abundantly wealthy class, India holds the world's poorest 10% (Hindu, 2014.) The highest 10% are in control of three fourths of the population and the lowest 10% hold virtually no wealth or assets.

India's top 10% have extended their wealth at a faster rate than the rest of the population, as a result their financial security is growing at a faster rate than the rest of the country. There are three ongoing trends to wealth accumulation. Firstly, there are steady rises for the overall population, some transitioning out of poverty. Secondly, a greater percentage of this rise occurs at the top. Thirdly, while this growth is occurring salaries

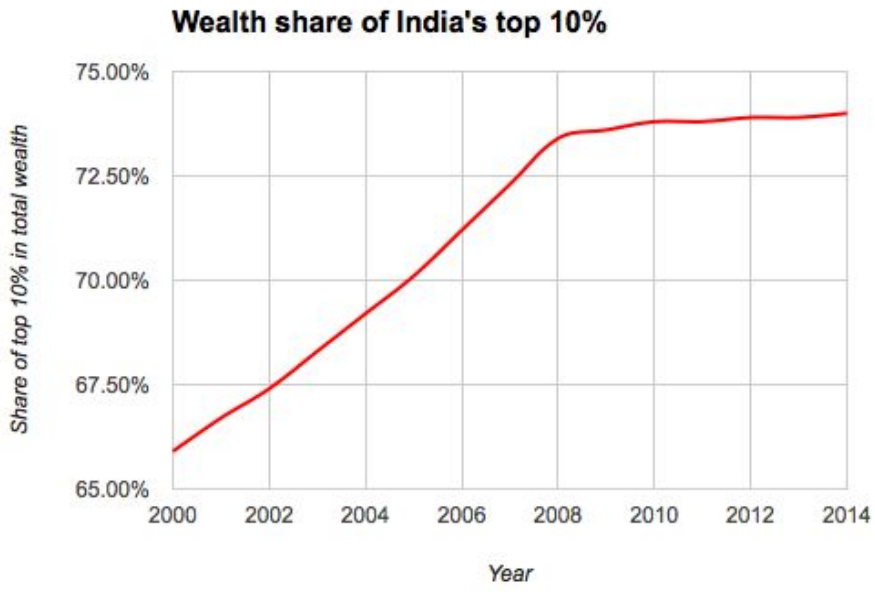


Chart 3: Wealth Share of India's Top 10% (The Hindu, 2014)

of those earning on average 90,000 rupees shrunk a decade ago and are expected to remain at stagnated rates (BS, 2004.) Many have believed that the poorer population is not growing poorer per se, only that they are growing at a slower rate overall relative to those

rising, when the wealth gap is in fact widening bi-directionally between the highest and lowest salaries.

The global opinion on India is that it is a country that needs to repair its rampant poor population. The growth policies that are employed have historically provided unequal assistance to the poor. Shown in (chart 4) is the ratio of change of top to bottom inequality is illustrated. Between the period of 2000-2002 to 2010-2012 the ratio changed about 6% showing the skewed nature of growth. The implications of the widening gap greatly correspond with unsustainable development and the side effects of growth ignoring consequences. Wealth, which happens to be restricted to a smaller segment of the population results in a disproportionate amount of waste and carbon emissions, which all citizens, large and small producers, are then exposed to. Exhibited in (chart 5) are the results of a study correlating global wealth with pollution.

Chart 4: Top-bottom inequality (The Hindu, 2012)

(Chart 5) shows the international representation of how the wealthiest 10% produce 49% of the global emissions. Upon examination the national case of India due to the nature of economics their ratio can be assumed near the same. Supporting wealth inequality inhibits overall growth in a few ways. Unbridled capitalism that drives wealth divisions to an extreme diminishes the consumer class which fuels further business growth. Additionally, an extreme divide in wealth can impair the amount of finance necessary for investment. For example, if you take 1000 individuals with a combined salary of 1 million,

and one individual with a personal salary of 1 million, the sum of spending to offset true costs and preserve clean air by those thousand will always be more than the total spent by one individual, because 1000 people in total consume more air than just one. This is the economics engine that drives society in that people pay for amounts of what they personally need. The end result is that the overall consumption of an oversized wealthy class does not equitably offset negative externalities financially compared to total consumption; resultingly wealth inequality contributes to unabated pollution.

What is known to be the best solution for the consequence of emissions during GDP growth is investment towards renewable technology. (Chart 6) shows the how the relationship between GDP and emissions after having long paralleled, diverged in the last few years. The trends in GDP and emissions growth were near identical up until 2012 where GDP took a sharp rise but global emissions rose but at a more leveled rate. This is

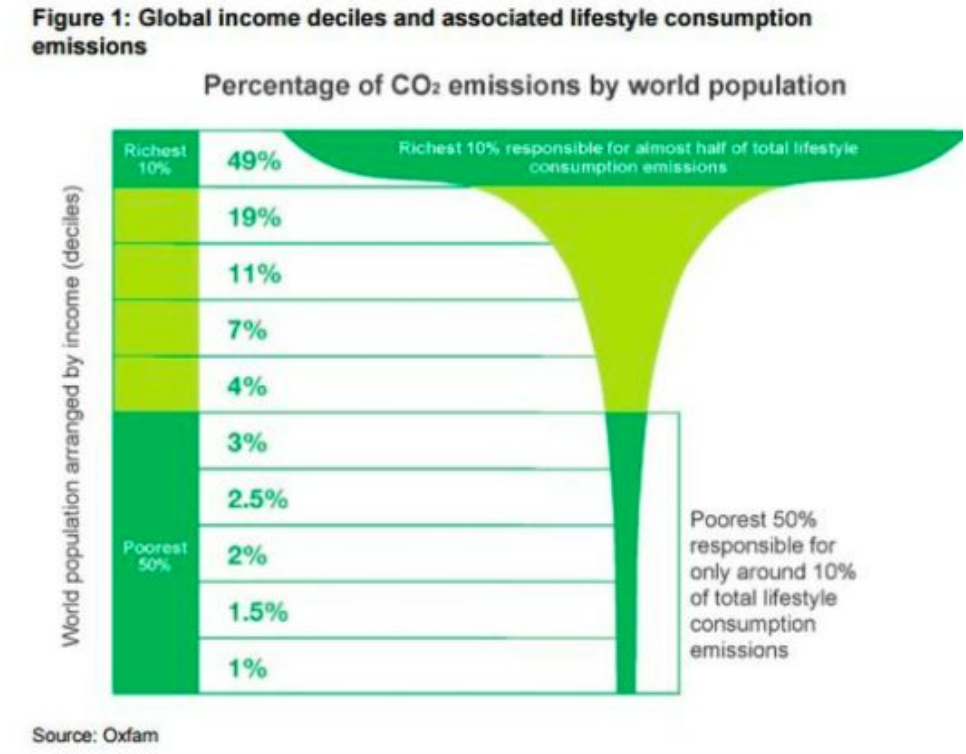


Chart 5: Percentage of CO2 Emissions by World Population (Daily Mail, 2015)

attributed to the intense expansion and financial investment in renewables, particularly in India and China (Bloomberg, 2016.) This shows that it is not only possible to slow

emissions trends but to slow emissions while still maintaining a positive rate of growth. This however is occurring as wealth inequality and emissions levels continue to grow. Trends towards renewables have grown but not with policy or to a level that has reversed the emergent issues of wealth inequality and the environment.

Income inequality is not an Indian problem but a global problem. The sources of this wealth inequality and finding the proper growth strategies to supersede the negative impacts are a key part of sustainable development. There is also the distinction that wealth inequality is not a prerequisite for a healthy economy, otherwise developed countries with smaller income gaps like many within Europe would not be able to sustain. Development growth strategies that favor income inequality and assistance for the super wealthy are the dominant method for development because of historical pretense. In India despite a congressional stance for uplifting the poor, the administrative strategy has remained in supporting overall wealth over unilateral wealth.

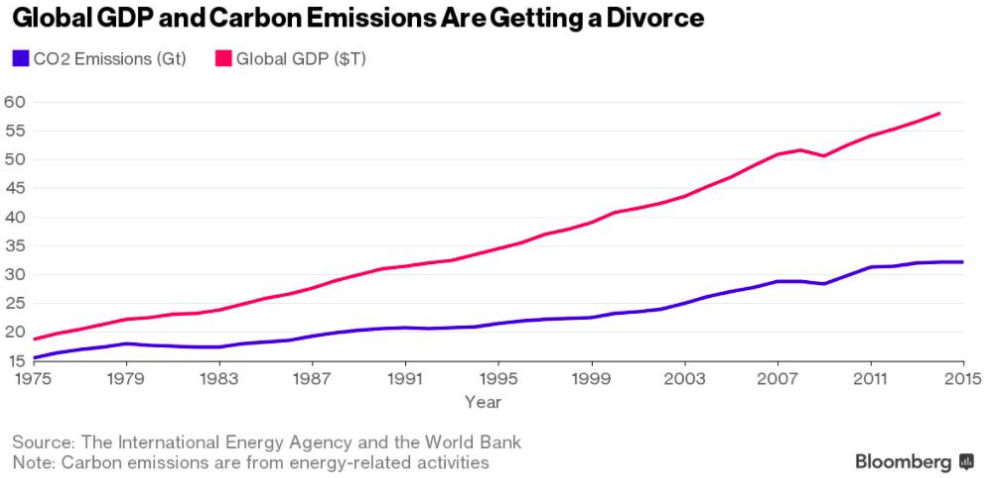


Chart 6: Global GDP and Carbon Emissions (Bloomberg, 2016)

4. Principle Three: Energy, Emissions and Public Health

India's growth and heavy reliance on industry have caused India to be at the forefront of several issues relating to pollution. The crisis of air pollution in India has resulted in about 1.5 million annual deaths as a result of both outdoor and indoor air pollution. This pollution is mainly derivative of different unclean energy sources such as the burning of coal, hay and cow dung for cooking fuel. The human cost is that India has become the country with the world's highest mortality rate from chronic respiratory diseases and asthma (Harris, 2015.) One in seven children in Delhi are currently born with respiratory illnesses. Thirteen percent of child mortality (under age 5) is attributed to acute respiratory illnesses (WHO, 2013.)

On the Yale Environmental Performance Index, out of a rating of 178 nations, India falls at 155. This ranking is determined by a culmination of environmental factors. Further examining how India ranks in environmental subsections within this index India ranks at 174 for Air Quality, 124 for Water and Sanitation, 125 for Biodiversity and 117 for agriculture. Not only are these positions very low in global comparison, but particularly India in regards to air quality falls at the bottom 2%. Air quality has drastically worsened in recent years to a higher degree than other environmental factors (EPI, 2014) to a point where air quality has become exceedingly unsafe. This is particularly because Delhi in the current year of 2015 is the number one city globally for air quality pollution according to the World Health Organization (WHO.)

The commons of land, air and water quality are also in positive correlation with India's energy emissions. This means in order for energy production and environmental quality to have a negative correlation, energy supply would need to be controlled in a way so that the emission of greenhouse gases would be within safety limits. There are projects that are being undergone successfully partially because of the Clean Development Mechanism but preventive measures are not the primary focus.

Waste management is one of the primary preventatives to water pollution and human and wildlife habitat pollution. India has immense problems with rivers, which have been sacred and considered holy, being tainted by water pollution. The Ganga River and

Figure 2: Depiction of Cow Dung Energy

the Yamuna basin in Delhi suffer from pollution due to industrial affluence, historic ritualistic deposition of the dead and cattle bathing. In many regions in India an additional factor is the lack of sewage treatment, where sewage is deposited in many of India's shared rivers. The Yamuna is the main water way for Delhi as well as six other states within India. It is contaminated with exceeding amounts of pesticides, organic pollution and heavy metals (Yale, n.d.). Within Delhi 6% of the population survives in all daily functions drinking, hygiene and cooking off of completely untreated water (DE, 2016.)

The water and land is impacted through the lack of collection and untreated waste that is deposited. India has a waste management collection system funded at 0.3% of GDP, an average figure for a developing nation. However, as the Indian economy transitions this figure needs to transition as well. Between 70-80% of waste in Delhi is collected and dumped in open landfills. The remaining waste is left uncollected migrating between city and nature. The whole materials and their chemical subcomponents then affecting the quality of water and soil. There is overcrowding in the landfills and despite a daily expected increase per day in waste generation from 8,360 tons per day municipal solid waste (TPD MSW) to between 17,000-25,000 TPD MSW by 2021, few new landfills or

waste elimination methods have been proposed and a clear potential for overcapacity (Talyan, Dahiya and Sreekrishnan 2007.)Furthermore, there is near to no formal recycling done by the state, 10% of collected waste is composted and then 30% is recycled by garbage pickers at open dumps and brought to low-quality factories in the slums built as a source of income by former rags to riches slum residents. The dependence of the slum community on landfills becomes increasingly dangerous for these communities as quality of the landfills deteriorates. Additionally, Delhi faces the problem the waste collection does not include hazardous or institutional waste e.g. medical waste. The waste that is not collected from large businesses or hospitals is released directly into the rivers. In (figure 3) are listed the different types of waste involved in waste collection, which are not all being managed partially or fully.

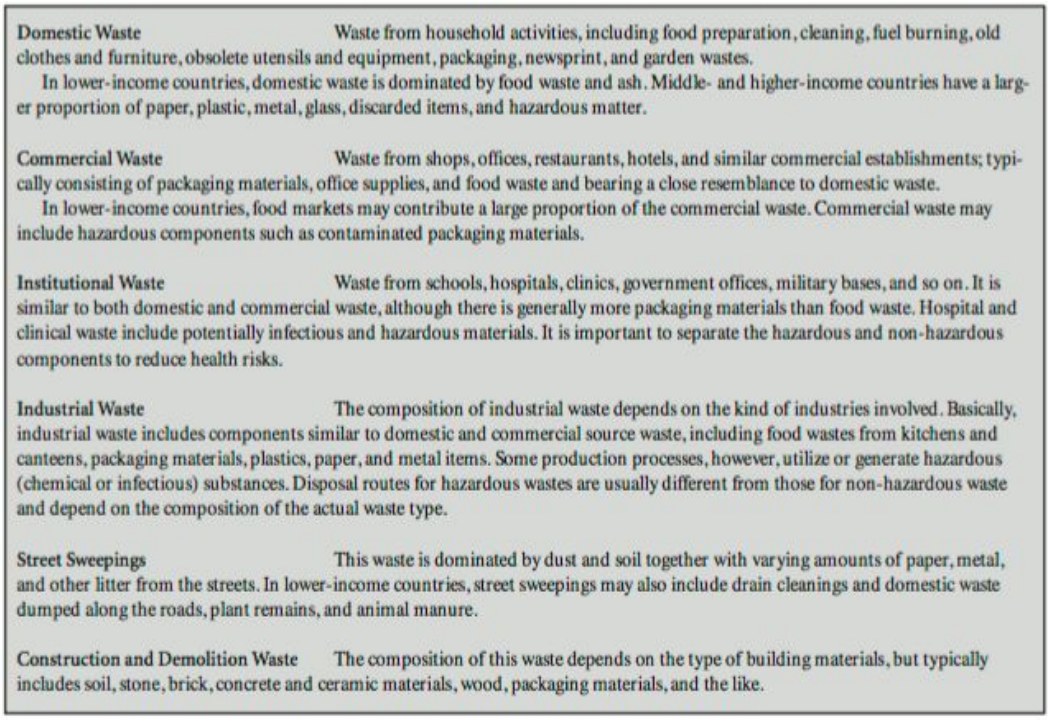
The Yamuna and Ganga are recipients of the culmination of these multiple types of pollution affecting not only health but businesses which depend on a water heavy water supply. The combination of the breakdown and deposition of several different types of waste into the these rivers has made them contaminated. The high ammonia content of the Yamuna has made the water unusable for business operations (BS, 2016,) while also being hygienically unsound.

The current investment for the 2014-2015 year for renewables in India, excluding nuclear, is $1,022 million USD, of which $556 million USD is paid by internal and extra budgetary resources (IEBR) and $292 million USD from the National Clean Energy Fund, that is financed through taxation on the coal industry (MOF, 2015). Currently more than half of renewable energy projects in India are financed through debt financing and profit from state-owned corporations. The remainder is paid for by roughly 0.025% of the national budget.

The major projects in existence are insufficient to support the crisis of Delhi or the mass population of India. Since energy demand is on the rise in India coal spending for the 2014-2015 year is $2,326 million USD, largely from IEBR and increasing at a faster rate than renewables. As a result policy makers at the Paris Summit have pledged to enable upcoming coal developments in India with cleaner coal technology. However, this

perpetuates reliance on nonrenewable energy sources that do not advance new technology, enhance national energy security or significantly diversify the energy matrix.

In Delhi the majority of flue gas emitted from large-scale coal plants does not undergo flue gas scrubbing creating poor environmental conditions. As a whole 85% of national energy comes from coal fired thermal generation (Mittal, n.d.) These plants operate with a steam engine design where water passes through a steam generator heated by ground coal achieving a production capacity depending on scale between 500MW-4000MW. In Delhi the main power plant, Badapur Thermal Power Station, generates energy at the lower end of the megawatt scale. Power stations within Delhi are an aggregate of the oldest and least developed technology. Cycling water for thermal generation from the heavily polluted Yamuna River has further deteriorated the quality. The coal used for power generation being predominantly ground coal is low in grade and contributes a high ash content. The technology exists within these plants to steam blow particles as a form of filtration and self clean the water but with low efficiency. Furthermore, the effluent is left untreated and is the main contributor to the climate issues of today.



Domestic Waste	Waste from household activities, including food preparation, cleaning, fuel burning, old clothes and furniture, obsolete utensils and equipment, packaging, newsprint, and garden wastes. In lower-income countries, domestic waste is dominated by food waste and ash. Middle- and higher-income countries have a larger proportion of paper, plastic, metal, glass, discarded items, and hazardous matter.
Commercial Waste	Waste from shops, offices, restaurants, hotels, and similar commercial establishments; typically consisting of packaging materials, office supplies, and food waste and bearing a close resemblance to domestic waste. In lower-income countries, food markets may contribute a large proportion of the commercial waste. Commercial waste may include hazardous components such as contaminated packaging materials.
Institutional Waste	Waste from schools, hospitals, clinics, government offices, military bases, and so on. It is similar to both domestic and commercial waste, although there is generally more packaging materials than food waste. Hospital and clinical waste include potentially infectious and hazardous materials. It is important to separate the hazardous and non-hazardous components to reduce health risks.
Industrial Waste	The composition of industrial waste depends on the kind of industries involved. Basically, industrial waste includes components similar to domestic and commercial source waste, including food wastes from kitchens and canteens, packaging materials, plastics, paper, and metal items. Some production processes, however, utilize or generate hazardous (chemical or infectious) substances. Disposal routes for hazardous wastes are usually different from those for non-hazardous waste and depend on the composition of the actual waste type.
Street Sweepings	This waste is dominated by dust and soil together with varying amounts of paper, metal, and other litter from the streets. In lower-income countries, street sweepings may also include drain cleanings and domestic waste dumped along the roads, plant remains, and animal manure.
Construction and Demolition Waste	The composition of this waste depends on the type of building materials, but typically includes soil, stone, brick, concrete and ceramic materials, wood, packaging materials, and the like.

Figure 3: Waste Varieties (World Bank, 1999)

Leaving effluent untreated is especially harmful to climate issues. Inefficient technology is the main contributor to climate change so allowing the emission of greenhouse gases within India made a large impact on the stability of the global environment. In india the expectations within the next 5-6 are increased levels of greenhouse gas pollutants. CO_2 is expected to increase from 714976 Gg (Gigagram) to 914680 Gg, SO_2 from 4734 Gg to 6051 Gg and NO from 366 Gg to 469 Gg (Mittal, n.d.) This represents the overall quantity not concentration levels. In terms of concentration levels Delhi has already exceeded safety limits at over 400 ppm (mg/kg) CO_2 (Yale, 2014) while safe limits are within the 250-350 ppm range. Sufficient and abundant clean technology is not yet in place to counterbalance the diminished air quality. This imbalance in clean energy spending already threatens Delhi's human safety limits with irreversible effects and a lack of assurance for the safety of the future generation.

5. Economic History

The quality of total capital erodes when the interconnectivity between capital subdivisions is ignored. The aversion to a growth policy for fear it may inhibit sovereignty or development is a non factor when the current design already is compromising development aims. India has had in the last three decades two types of developmental reformations that have both more positively than negatively affected growth. However, the introduction of the second reform was in reaction to the negative impacts of the first. Looking at the history of India's political growth plans indicates how the current outcomes and consequences became present today and point to a third reform to correct for the negative impacts of today.

5.1 Growth First India

The "growth first" model policy reforms are considered to be what jumpstarted India's constant growth rate, some economist like DeLong (Panagariya, 2004) even speculate it is the change in attitudes caused by these reforms gave India the drive that sustains itself today while others contest this. So what were these reforms? In the 1970's the Indian economic policy was the polar opposite to the policies of the 1980's and even of today. They phased out liberalization and tightened import controls. This resulted in little capital equipment and technology to force industrialization and build machinery (Panagariya, 2004.) There was no big industry but mostly small native industries and a relatively low foreign debt (Kohli, 2006.) This started to change and between 1976-1987 India expanded its Open General License (OGL) list allowing for more imported capital goods by ten fold. Between 1980-1981 and again between 1987-1988 they allowed for items previously under control by the Indian government, or canonized items, such as petroleum products to be privately imported by entrepreneurs to increase private wealth and their share of private imports. 1n 1985 import constraints were even further relaxed by giving exporters replenishment licenses allowing them to import twice as much as previously.

During 1985 export credit agencies issuing finance reduced the pay back interest rate from 12% to 9%. They then de-licensed 25 industries, which were then allowed to pave the foundation for business growth notably in coal, motor vehicles, sugar, chemicals, steel and large textile industries requiring extensive power. With a provisional minimum investment anyone or firm could participate in these industries, and the industry list grew again to 31 industries by 1990 (Panagariya, 2004.) Public sector investment became somewhat more prominent as infrastructural policies facilitated improvements to certain parts of the public sector.

In 1986 a large amount of reform was implemented. The government of India began to allow duty free imports. Businesses were given an extra boost and upon achieving 80% capacity utilization they were allowed to expand to 133% of current capacity. Big businesses were then given a boost, particularly monopolies. During this time certain monopolies of substantial size and wealth were subjugated to growth restrictions under the Monopolies and Restrictive Trade Policies Act (MRTP) and not legally able to implement the previously enacted business incentives, which helped small businesses. These growth restrictions on big businesses bound under the MRTP were eased. All the small native industries were given assistance into expanding into big businesses and already big businesses were allowed to grow even bigger. Exports were rapidly expanding. In 1986 the prices on aluminum and cement were brought down drastically through decontrolling measures bringing these commodities to the market while previously they sold through an underground exchange. The next business incentive was the introduction of a modified value-added tax (MODVAT,) which reduced the excise tax on goods produced within the country.

Between 1988-1991 the last of the big policy reforms were made. The OGL list was expanded for a second time to permit 30% more capital imports. An introductory 50% tax deduction on business was later increased to 100% tax deductibility on profits, giving business even more growth potential. At the end of this period the government further incentivized imports and exports by lifting investment licensing allowing for further industrialization (Panagariya, 2004.) During this whole period and still much of the case

for India today is they at this time had a depreciated exchange rate, which made excessive importation very expensive. The culmination of all these policies over the last decade produced a trade imbalance with a categorically high external debt.

5.2 Consequential Debt

The pro-business policies of the 1980's were not without high governmental investment intensity. These initiatives led to the Indian economic crisis of 1991. During this fiscal crisis two enormous debts accrued. Firstly, India had amassed an internal debt of 47.9% of its GDP and an external debt of 12.3% of GDP by late 1989 to early 1990 (Chelliah, 1991.) In (figure 4) the external debt and total domestic debt accumulated given in rupees is displayed.

The figures in rupees were subject to different exchange rates in 1990. The conversion of these amounts to USD will be made in order to demonstrate the mass and consequential need for a debt crisis bail out. The exchange rate in the year 1990 was 2.38387 rupees for every 0.14 USD cents (fxtop, n.d.):

$$Total\ Domestic\ Debt + External\ Debt = 2.38387e + 12\ Indian\ rupees$$

Thus:

$$Total\ Domestic\ Debt + External\ Debt\ in\ USD = 0.14e + 12$$

From this calculation we derived that the debt for India, domestic and external in 1990, was equivalent to 140 billion USD. The division of these two amounts into external and internal debt, with the exchange rate of 2.0987 for every 0.12 USD and 0.28517 for every 0.02 USD would be as follows:

$$Total\ Domestic\ Debt = 2.0987e + 12\ Indian\ rupees$$

$$Total\ Domestic\ Debt\ in\ USD = 0.12e + 12$$

And:

$$External\ Debt = 2.0987e + 12\ Indian\ rupees$$

$$External\ Debt\ in\ USD = 0.02e + 12$$

The result is that the total internal debt of India at the time was 120 billion USD and the external debt 20 billion USD.

The debt amounts from that period (1980-1991) are not the projected debt into the year of hypothetical debt that the global community aims to prevent a near decade from today, i.e. 2025 the year ending a decade of new policy reform. The future values of debt are calculated by utilizing the base amount for the Indian 1990 total internal and external debt is calculated over a 36 year period (1990-2025) and compounded interest for the average inflation rate of India over the last 24 years (1991-2014,) which is 7.7% (inflation.eu, 2014.)

$Pn = Estimated\ Internal\ and\ External\ Debt\ in\ 2025$

$P = Base\ Amount = 140\ billion\ USD$

$i = Inflation\ Rate = 7.7\%$

$n = Difference\ between\ base\ and\ selected\ year = 36\ years$

$$Pn = P(1+i)^n$$

$$Pn = 140\ billion\ USD(1+.077)^{36}$$

$$Pn = (1.4e+11)(1.077)^{36}$$

$$Pn = 1.4e+11 \cdot 14.447$$

$$Pn = 2.022580e+12\ or\ 2.02\ trillion\ USD$$

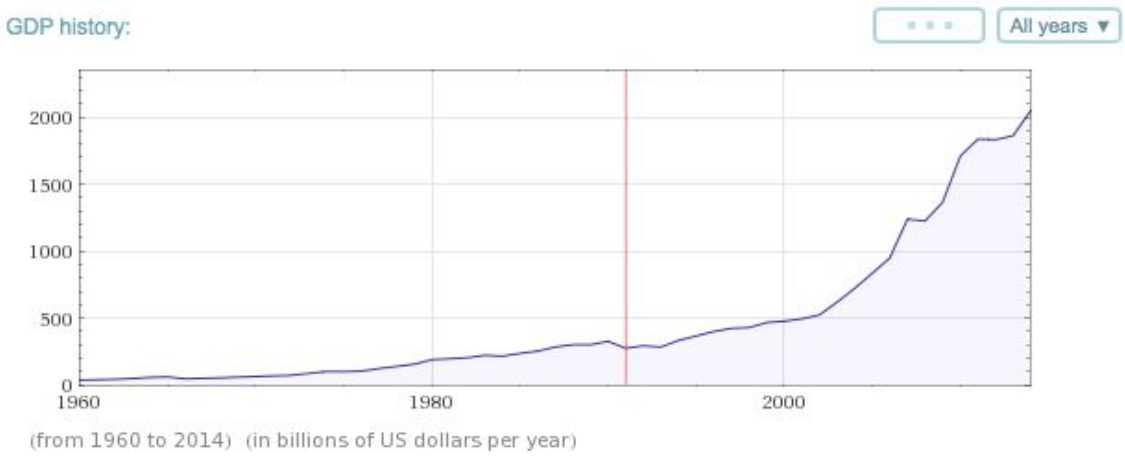
The external debt and extensive internal borrowing led to a current account deficit which caused the crisis of 1991. The debt was the equivalent of over 2 trillion in debt today, 1.6 trillion internally and 337 billion externally. The external debt was much greater than any deficit India has had in recent years. India at this time was on a dangerous path to defaulting as they only had in reserve enough in to cover two weeks of imports (Bandyopadhyay, Roy, 2009.) This resulted in the Indian government taking a 1.8 billion USD IMF Loan (George, 2001.) In order to secure this loan India had to mortgage part of

Indian Growth First Era Debt and Composition		
	In Billion Rupees	**% of Total**
Market Loans	624.42	29.80
Small Savings	409.83	19.30
Provident funds, etc. (Pension)	436.43	20.80
Treasury Bills	632.02	30.10
Total Domestic Debt	2,098.70	100.00
External Debt	285.17	
Total Domestic Debt/GDP	47.90	
External Debt/GDP	0.65	
Total Debt/GDP	48.55	

Figure 4: Indian Growth First Era debt and Consumption (International Monetary Fund, 1991)

their gold reserves. To raise the equivalent of $600 million India mortgaged 47 tons of gold to the Bank of Switzerland and 20 tons of gold to the Bank of England. This secured India for the next payment terms as they simultaneously made economic reforms to halt the increasing indebtedness (Rajghatta, Sinha, 2009.)

The nominal GDP of India at this time was fractional compared to today at a total of about $300 billion annually, compared to the near 2 trillion of today as you can see represented in (graph 1:)



Graph 1: Indian GDP History (Wolfram Alpha, 2016)

In this graph the red intersecting line represents the year 1991. The financial amounts can be alarming seeing that the debt in 1991 was half of the annual GDP and after inflation the debt would equal the GDP of today. The alarming amounts triggered a political fear of internal investment that could potentially revert the current economy back to the state of 1991.

This borrowing towards 27-31 different industry sectors occurred at a time where renewable energy and clean technology were not developed and hard to replicate since the development spending needed today was not implicit in the spending crisis of the 1980's. Energy investment, then and today being coal, was part of the budget. The governmental budget of that time was divided into two categories, developmental and non-developmental expenditures. As can be seen in (figures 2-4,) developmental spending such as power and waste management achieve some growth at this time but were not the main sources of the debt.

The government expenditure was directed predominantly toward non-developmental initiatives, mainly defense, grants and business subsidies as the tabular balance in (figure 2) is clearly larger than that of developmental spending. What has been translated into the politics of developmental design for the next decade in the case of India

Indian Growth in Revenue Expenditure of the Central Government (Compound Growth Rates)					
1-a			Growth Rates		
	1975	1989	1975-89	1975-81	1981-89
	In Crore				
Revenue Expenditure: Non Development					
Nondevelopment expenditure (adjusted)	4,069.69	37,189.79	17.38	13.07	20.22
(Interest Payments)	1,000.76	14,150.00	20.95	16.72	23.58
(Defense services, net)	1,920.21	11,070.05	14.23	9.65	16.00
(Organs of state)	59.80	287.88	11.62	7.87	15.04
(Fiscal services)	122.61	1,173.44	16.91	13.49	20.55
(Tax collection charges)	85.37	500.54	12.63	6.53	17.67
(Administrative services)	326.37	2,087.96	13.89	8.44	17.60
(Police)	169.24	1,256.75	15.48	8.67	20.10
(External Affairs)	34.45	201.06	12.73	8.94	15.63
(Pension and other retirement benefits)	19.53	443.88	23.77	23.07	25.81
(Assignments to local bodies)	15.99	54.51	10.19	11.16	7.50
(Grants to union territories, nonplan)	22.07	51.85	10.82	17.19	0.66
Of which:					
Subsidies	429.69	6,897.11	21.43	22.27	24.04
(Loss/subsidy on vegetable oils)	--	--			
(Subsidy on controlled cloth)	--	27.00	23.77	416.28	-15.37
(Subsidy to food corporation of India)	295.00	2,200.00	15.80	16.35	19.68
(Subsidy to cotton corporation of India)	--	--			
(Others)	134.69	1,420.11	17.75	16.43	18.06
(Fertilizer subsidy)	--	3,250.00	37.90	37.50	42.01

Figure 5-1: Indian Growth in Revenue Expenditure of the Central Government (International Monetary Fund, 1991)

is predicated on the inaccurate assumption that development spending will replicate the mistakes of former internal investment policies. The correlation between spending on development with debt accrual has no historical evidence. Debt will only accrue if renewable investment spending comes from heavy internal borrowing or a trade deficit. If investment on the other hand can come from direct sources like taxation, this can implicate a non-indebted sustainable investment future.

2-a					
Revenue Expenditure: Developmental					
Development expenditure (adjusted)	822.46	9,422.90	16.94	16.18	19.13
(social and community services)	461.70	5,248.87	17.52	11.80	22.37
(Education)	149.36	2,131.81	18.31	10.89	27.31
(Art and culture)	8.88	116.52	20.46	9.44	33.05
(Scientific services and research)	112.02	984.85	17.00	11.63	19.89
(Medical, public health, sanitation and water)	68.77	517.69	13.56	13.11	15.77
(Family welfare)	58.59	640.92	18.21	6.42	21.24
(Housing)	11.28	83.73	16.08	16.87	12.29
(Urban Development)	0.61	85.69	42.65	23.16	55.50
(Broadcasting)	22.06	318.25	18.67	18.93	22.73
(Labor and Employment)	22.92	261.51	17.91	18.06	19.41
(General economic services)	96.80	1,536.49	15.47	27.29	14.42
(Agricultural and allied services)	128.52	1,528.30	17.91	19.13	19.34
(Water and power development)	17.81	240.45	16.84	13.50	13.82
(Transport and communication)	99.79	758.53	15.79	18.98	12.50
(Public works)	17.84	110.26	14.94	3.33	24.39
(Self-balancing items)	3.75	9.68	-14.40	-20.47	18.46

Figure 5-2: Indian Growth in Revenue Expenditure of the Central Government (International Monetary Fund, 1991)

2-b					
Grants	881.62	7,736.41	17.08	18.27	19.41
(Statutory grants to states)	497.92	1,360.51	6.85	-7.50	21.90
(Paln Grants)	278.65	3,096.71	17.27	25.41	15.40
(Grants to states.U.t.s.)	105.05	2,979.19	29.26	44.71	24.22
(for drought-prone area program)	26.36	51.00	0.84	5.66	4.28
(for rural water supply scheme)	--	375.90	24.17	32.56	19.17
(for rural roads)	--	--			
(for gainful employment in rural areas)	--	528.00	24.05	219.61	14.78
(for welfare of backward classes)	40.50	199.57	10.89	12.42	10.90
(as special central assistance for SCs)	--	178.27			
(toward special incentive scheme)	--	722.00			
(Misc. grants to state/UTs)	38.19	824.45	31.49	24.20	31.31
(Grants to state for natural calamities)	--	300.00	23.87	138.96	9.02
(Adjustment on accounts of difference in figures)	-63.76	--			
(Total Expenditure)	5,713.76	54,358.78	17.25	14.52	19.92

Figure 5-3: Indian Growth in Revenue Expenditure of the Central Government (International Monetary Fund, 1991)

5.3 Make in India Reforms

India is already on track to making their economy a big investment haven, a strong facilitator of their developmental future. As mentioned this foreign direct investment is one of the main fund pools for renewable energy, a step that began in 1991 with the liberalization of market regulations called Make in India. During this time nearly all

restriction on foreign investment, business licensing and trade restrictions such as tariffs were completely lifted. Many industries are permitted the free flow of 100% FDI. Energy, excluding atomic, and waste management (RBI, n.d.) are two of the sectors that permit 100% FDI to growth. Specifically in regards to solar and wind energy are high incentives, including a 30% financial subsidy for solar grid projects (MII, 2015.)

Despite the attempts to rapidly grow the power sector as much as other industries, this area was one where FDI was not flowing substantially, leading to an Electricity Bill in 2003 to encourage FDI for a second time to this sector (Panagariya, 2004.) The funding is primarily diverted towards coal and then to a lesser extent, alternative energy, however the Electricity Bill established increases to renewable energy tariffs to increase their marketability. Renewable energy investment accelerated in several provinces accruing to the inflow of 1.76 billion USD since 2012 (energetica, 2013.) These projects as previously mentioned do not actually intervene in the electricity void and high emitting regions of outlying Delhi. Waste management and energy, especially clean energy technology, have not received enough funding in Delhi relative to other industries, even with market liberalization efforts and increasing international political and climate pressure.

The program functions already as one of the most highly successful programs India has. The current benefits to India are the increased energy while the investors mainly benefit from the allowance of 100% FDI, earning all the profit from the investment while promoting job and infrastructure in India. The combination of this series of policies starting from the 1980's and reform of the 1990's has solidified the financial stability of India.

The economic state of India currently primes different outcomes for future policy. Today India benefits from the big national business and investment coming in. The contributions of these policies lead to improvements from the time of the crisis reducing the external debt to a fractional 11.6 million (TC, 2015.) It was with these reforms they were able to get out of a financial crisis while continuing to grow and while also having the benefit of big local businesses they were able to create during the previous years. It was also the sum of these reforms that made India develop industrial projects today with low internal costs. The issue that lies in in the fact that FDI is flowing in but necessary clean

energy projects remain underfinanced, requires an alteration to the current policy that generates finance and expands sector investment.

5.4 Current Conditions

The combination of these various reform changes established the notable characteristics of India today. What can be seen from the internal economic history of India is today's product in developmental policy. Firstly, they have a society where the predominant local industries are massive in scale, entities with monopolistic size and bound to little political restrictions. Essentially the corporations of India were grown to a scale with policies and mentality that shows favoritism to their growth and profit. This has allowed for the extensive waste that has been created today, while having not enough tandem policies or strategies offered to offset pollution at a faster rate than at which it is created. India is at a tipping point where the level of significance of existing pollution is inconsistent with the current input of political ingredients.

The product of these ingredients arose from the extensive debt fear from the crisis in 1991, where state finance was abandoned to adapt a strict foreign and private investment only policy. The debt fear has made internal spending on growth and development rare, even though historically development spending did not contribute to the financial problems of the past. FDI will likely be hindered if the environment and infrastructure grow increasingly unattractive for investors. Debt fear and corporate favoritism within India has led to a lack of protection for the Indian environment. Foreign investors can help India but only India can make policy choices that improve their internal situation. India has reached a point where it needs a new financial policy measure to protect itself and expedite renewable energy. The balance that needs to be struck is increased financial support towards the waste and clean energy sectors.

6. Research

The discrepancy of finance towards towards the power sector and waste management sector requires change. If finance to these areas were compensated internally, not through borrowing but revenue India could drive its own development while eliminating debt fears. Delhi as the exemplification of a state where the history has caused an unsustainable severity between health and growth, makes this region the prime focal point for new developmental politics. With the sequence of events that has amounted to present day Delhi deriving new finance toward developmental reform will be calculated.

6.1.1 Research Methodology and Survey Design

The research question to answer is if Delhi can financially offset the costs of sustainable development through income tax. To estimate the factors contributing to how much an average Delhi citizen would contribute in income tax with the implication of improvement in public sector investments and correlative health, a survey was conducted. A face-to-face survey was designed which modeled different clean development pathways based on how much financial growth was delivered into the budgets of waste management and renewable energy (excluding nuclear.)

Cards were created to present the selection criteria for the participants to make a choice. Each card listed the positive and negative environmental and health externalities by 2025 resulting from increased or decreased waste collection and non-pollutant energy. There were 12 adjusted plans each reflecting varying costs to the individual. The cost to the participant was reflected in the form of an income tax, which altered the amount of tax they pay annually, adjusting the individual's take home salary. The cards were labeled A through L, and the first of the 12 cards reflected the status quo. The participants were first read definitions and shown pictures so it would be clear they understood the terms used in the study. They were then allowed to read cards A through L and then asked to make a choice between the possible development outcomes supported financially by different income tax price points. The choice to remain with the status quo would implicate that externalities and individual tax rates would remain unchanged.

In order to qualify for the survey each participant had to be of age and a taxpayer within Delhi. A total of 400 citizens of Delhi were surveyed. At the end of survey participants were not required to but suggested that they make comments as to why they made their choice. Those reasons hinted at the personal interests for choosing to make a change or maintaining current tax levels. An example card showing how each choice appeared to the participants is shown following:

Table 1: Choice Card

Option D	
Waste Collection and Clean Technology Expenditure	Waste Collection (0.4%) Clean Technology (0.025%) Total (0.425%) Tax Increase +(0.1%)
Externalities by 2025	**Decreased Land Pollution:** • *Improved* nutrition and agriculture. • Visibly clean land. **Decreased Water Pollution:** • *Low chance* of gastrointestinal disease. • Visibly clean/safe drinking water. **Lower Air Pollution:** • *Some chance* of respiratory illnesses and cancer. • Some air pollution and smog.
Income Tax Out-of-Pocket Annually	
₹0 - ₹200,000	₹0
₹250,000	₹0/₹25,250
₹300,000	₹30,300
₹350,000	₹35,350
₹400,000	₹40,400
₹450,000	₹45,450
₹550,000	₹110,550
₹650,000	₹130,650
₹750,000	₹150,750
₹850,000	₹170,850
₹950,000	₹190,950
₹1,050,000	₹316,050
₹1,250,000	₹376,250
₹1,500,000	₹451,500
₹2,000,000	₹602,000
₹5,000,000	₹1,505,000

The colors on the card in the externalities section indicate whether the externalities are positive (blue,) negative (red,) or mild (orange.) The colors on the out-of-pocket salary section represent the tax brackets. The salaries in light blue are non-taxpayers, purple is the lowest tax bracket, green is the middle tax bracket, and orange is the highest tax bracket. The yellow represents the lowest salary in which women do not pay taxes but men do. Taxation in India differs for males and females, starting salaries at $4,023 USD annually for males and $4,505 USD annually for females. The bottom left side represents the annual salary in INR while the bottom right represents the annual taxes they would pay per year by choosing this initiative. The participant would find their annual salary to the left and then see what it would cost them to the right as an individual for this plan. The exchange rate varies around 1 rupee being equivalent to $0.015USD.

The percentages above, which translate to the tax amounts represent an acceptable range for investment in waste management and clean initiatives. The standard for waste managements is a range of 0.2%-0.4% percent with India being currently at 0.3%. Different cards represented one of these three percentages. The clean initiatives finance represented a range of 0.015%-0.4%, with the current real number being at 0.325%. To not exceed an outer limit not representative of any real life environmentally efficient developed country, 0.4% was chosen as being slightly above the energy initiative budget of Sweden (Regeringskansaliet, 2015,) to represent a healthy realistic range.

Table 2: Delhi and Contiguous Suburbia Population and Taxpayers (EIU Canback, 2016)

Year	Pop	pop_3650to7306_usd	pop_7307to14599_usd	pop_14600to73063_usd
2015	1,311,050,530	16,006,235	3,346,255	398,550
2016	1,326,801,578	18,398,136	3,950,357	509,110
2020	1,388,858,913	33,696,383	7,481,209	1,289,917
2024	1,447,560,463	60,856,610	13,563,523	2,949,112
2015	25,703,168	1,471,252	418,092	89,294
2016	26,455,791	1,753,711	478,931	111,723
2020	29,347,622	3,936,107	796,757	247,829
2024	32,060,729	7,385,658	1,422,591	482,875

The second part of the research includes outsourced population data summarizing the total number of individual taxpayers within each of the three main tax brackets in USD. In (table 2) can be found the total tax paying populations for Delhi state and contiguous

suburbia. The first set of years ranging from 2015-2024 represent data concerning all of India. The second set ranging from 2015-2014 will be the data to be summarized, which focuses on tax paying citizens of Delhi. The revenue amounts are given in USD at the current exchange rate of mid-February 2016. The salary brackets are also listed in USD. These correspond to the amounts on (table 2) and (table 4,) which are 250,000-500,000, 500,001-1,000,000 and 1,000,001 to 5,000,000 rupees. The increasing amounts in population for the upcoming years are based on predictive statistics.

6.1.2 Data Analysis

Of the 400 people surveyed 346 responses represented usable data, which were analyzed for the survey. The research was conducted from March 2015 till July 2015. (Table 3) presents the overall summary of where choices fell upon a range. The minimum and maximum represent the included range of possible choices within the study. The mean in this case represents the average choice in the form of tax percent for the total number of participants, indiscriminate of salary. This total does not reflect the total increase but the

Table 3: Summary Statistics

Summary Statistics	
Mean	0.6298%
Median	0.6000%
Minimum	0.2150%
Maximum	0.8000%
Standard Deviation	0.1897%
C.V.	0.3012%
Skewness	-0.6874%
Ex. Kurtosis	-0.9540%
5% Percentile	0.3250%
95% Percentile	0.8000%
Interquartile Range	0.2000%

Total out-of-pocket percentage willing to be paid towards waste management and renewable energy. In order to get the tax increase, you subtract from the total amount on

the choice card the the status quo percentage of 0.325%. To derive this tax increase from mean choice participants made, you can subtract 0.325% from the mean in (table 3.)

(Table 4) gives a closer examination of the mean monetary amounts. The following is color-coded into the three tax brackets for the taxpayers in India. The first tax bracket of the lowest taxpaying income range is 10%, second 20% and the highest earners pay 30%. The mean cost for each individual salary point is represented in Indian rupees(INR) and US Dollars(USD.) The 3rd column represents the mean for each income tax bracket in USD.

Table 4: Mean Tax Estimates by Income Bracket

Salary	Mean Amount INR pp/pa	Mean Amount USD pp/pa	Mean Amount Tax Bracket USD pp/pa
INR 250,000	INR 362.49	$ 5.47	
INR 300,000	INR 563.12	$ 8.49	
INR 350,000	INR 1171.53	$ 17.66	
INR 400,000	INR 1061.65	$ 16.01	
INR 450,000	INR 1502.69	$ 22.66	$ 12.84
INR 550,000	INR 3575.60	$ 53.91	
INR 650,000	INR 4697.73	$ 70.83	
INR 750,000	INR 5546.05	$ 83.61	
INR 850,000	INR 4754.37	$ 71.68	
INR 950,000	INR 8845.12	$ 133.35	$ 74.00
INR 1,050,000	INR 11220.31	$ 169.16	
INR 1,250,000	INR 13542.22	$ 204.17	
INR 1,500,000	INR 14315.48	$ 215.83	
INR 2,000,000	INR 19974.77	$ 301.15	
INR 5,000,000	INR 0.00	$ 0.00	$ 217.02

To show the choice dispersion, a frequency table based on number of people per choice is displayed as (table 5.) (Table 6) represents the calculated income tax revenue by total and bracket in USD for Delhi and contiguous suburbia. These numbers we derived from factoring the population in each tax bracket by the mean amount in USD each tax bracket on average chose to contribute.

Table 5: Choice Frequency

Choice Frequency Row Labels	Total
0.215	3
0.225	4
0.325	65
0.400	5
0.425	2
0.500	5
0.600	96
0.700	5
0.800	161
Grand Total	**346**

Table 6: Developmental Income Tax Revenue

Year	Lower Tax Bracket Revenue	Middle Tax Bracket Revenue	Upper Tax Bracket Revenue	Total
2015	$ 18,890,876.00	$ 30,938,808.00	$ 19,378,584.00	$ 69,208,268.00
2016	$ 22,517,649.00	$ 35,440,894.00	$ 24,246,126.00	$ 82,204,669.00
2020	$ 50,539,614.00	$ 58,960,018.00	$ 53,783,850.00	$ 163,286,482.00
2024	$ 94,831,849.00	$ 105,271,734.00	$ 308,730,699.00	$ 508,834,282.00

In (table 6) are the calculated tax revenues by tax bracket and the combined total extending periodically through the year 2024. In this table within the period of 2015-16 annual growth in Delhi shows significant increases in revenue over each period. One of the reasons is that Delhi has a significantly higher growth rate than India as a whole, in fact double with a growth rate of 12.8% by 2015 (IBEF, 2016.) In (table 2,) this total figure is not the total revenue for the entire taxable population of Delhi, only the entire measurable taxable population of Delhi. Therefore these total figures are still exclusive of those earning upwards of half a crore. Furthermore, these figures include suburban Delhi, which comprises a much larger population than Delhi state itself. An estimate will be given in (table 7) what these amounts would be excluding the suburban population.

Table 7: Total Developmental Tax Revenue Delhi State

Year	Estimate of Total Revenue Excluding Suburbia
2015	$ 47,061,622.00
2016	$ 55,899,175.00
2020	$ 111,034,808.00
2024	$ 346,007,312.00

Here an estimate shows the tax revenue for the National Capital Territory of Delhi along with forecasted estimates till 2024. This amount represents Delhi state excluding contiguous suburbia which at a constant rate is between 67-71% of the greater population. For estimation 68% of the greater area is used for the calculation assuming a current Delhi population between 17.5 and 18.5 million.

(Table 8) and (table 9) represent the terms established to typify people's attitudes for their choice. These attitudes were not measured as explanatory variables where frequency was counted but as part of general comments. (Table 5) for reasons to make a change include "Cost/Benefit," "Civic Duty," "Improved Habitat/Environment," "Health," and "Long-Term Achievement." Health constituted the reasons for those who had health problems tied with air quality and wanted their conditions to improve. For Long-Term Achievement the participant's rationale was that their should be eventual improvement in environment and in the quality of life of future generations. Those who named Cost/Benefit were those that stated they pay for change if they believe the benefits are favorable to them. This could be result in an increase or decrease in the amount an individual pays, for example if a participant saw a greater benefit from saving rather than paying more they would opt for a decrease.

Table 8: Reasons for Change

Common Reasons for Change
Cost/Benefit
Civic Duty
Improved Habitat/Environment
Health
Long-Term Achievement

The typical reasons to maintain the status quo listed in (table 9) can be taken at face value. Distrust for government meant that participants did not believe tax dollars to be well spent. Presently satisfied meant they did not recognize negative externalities affecting their current state. Having no disposable income meant they were not financially equipped to pay an increase. These general statements were collected in order for participants to express if the tax supports ideas for the state they are in favor for or if they would create a burden in tune with the stance current political rhetoric has maintained.

Table 9: Reasons for Status Quo

Common Reasons to Maintain Status Quo
Distrust for Government
Presently Satisfied
No Disposable Income

6.1.3 Mean Estimations and Financial Implications

There are political reasons that contribute to why the environmental crisis has been subjected to political negligence in India. These political reasons on the surface rest of the backs of the wants of the people. The analytical research cannot pinpoint the real reasons however can identify whether the political assumptions about the financial ability of the people is true.

(Table 5) reveals that of the 346 acceptable participants, that of these a total of 72 chose to keep the status quo or make a decrease. The salary ranges for those who made this choice expands from the very lowest to very highest salary, encompassing the full range of salaries in between, not representing a singular group. This reinforces the lack of influence

salary has on making a change in general as also 274 participants of various incomes opted for an increase.

What the survey found, displayed on (table 3,) was that the average development tax package percent when deviating from the status quo of 0.325% is 0.6298%. This equates to an average desire to pay 0.3048% more of their annual salary. Thus people would be willing to pay around double what they are currently paying for waste collection and sustainable finance. When you take the total mean revenue per person this derives a sum of INR 6,320.85 per annum. This amount converts to an average USD 95.30 per person per annum.

This number represents an average over a wide variation of incomes. The figure represents a substantial interest to support change among the people. However, when we want to look at realistic application, (table 4) shows the average for each salary range and the average for the lower, middle and upper income tax brackets. For the lower tax bracket they would on average pay an increase of $12.84 USD per person per annum. The middle tax bracket would pay on average $74.00 per person per annum and the upper tax bracket would pay on average $217.02 per person per annum. These are the figures that can allow for strategic planning when it comes to taxation and policy. From these results how these amounts can be allocated will be determined.When looking at total revenue for the state of Delhi, the figures used for renewable investment allocation are the figures in (table 7.) By just going of 2016 as a base year, 56 million USD in annual revenue, then growing at a rate of 12.8% thereafter can show the annual amounts that can be used towards growth in renewables and waste management.

There are a number of other factors that can determine why people made their choice. It could be their personal history, moods of the day, personal attitudes and other things that cannot be foreseen. There are drawbacks within any survey, however the most consistent reasoned responses were noted. On (table 8,) in no particular order is the list of the most common reasons people gave for making their choices. There were higher frequencies for some reasons more than others but not measured relatively.

The most common reason for a wanting to contribute was civic duty. Participants often felt that it is their duty as citizens to pay taxes for positive changes and then for the government to implement them. In other words supporting the success of the system. The next most frequent reason would be that people want to see an improvement to the environment or habitat. The last three equally share having some small degree of frequency. When looking at reasons to remain with the status quo on (table 6,) the most frequently given reasons were either that the person was presently satisfied with the current state of affairs or that they did not trust the government to be able to carry out such an initiative. It was infrequent but some people chose the status quo since they had no disposable income after expenses to contribute.

6.2 Misrepresentations in Selection

When conducting a survey there must be a mention that unforeseen deficiencies are implicit in any research. To maintain as much transparency as possible, and to truly understand the Indian situation, these deficiencies will be disclosed. These research deficiencies can be placed into two categories, drawbacks to research data and cultural adversities.

6.2.1 Drawbacks to Research Data

When asking survey participants if they are willing to contribute an additional percentage of their income on top of their taxes, we have to ask the question, is this amount influential? In the West such a number might be. For the salary of a lower-middle class American earning $25,000, 0.6298% or mean choice, is an annual addition of $157.45 upon current taxes. The meaning of this amount can vary based on the cost-benefit to the individual. Depending on their disposable income this amount could be a high threshold for for an individual who is supporting a large family with one salary. The cost for products and services to salaries earned in the West are proportionally higher than the relative costs in India. What we find when investigating India is that due to the low price of goods and services relative to the salaries of lower-middle class to upper class, the average working

Indian has a larger disposable income within their own economy than you would find within the economies of the West. As a result what has been found in India is that the relationship between income and tax increase is slightly watered-down.

The predictive data in (table 7) passed 2016 does not count on changing tax policy nor rising incomes. Future estimations are made on the presumption that incomes will fall within this typical range in the upcoming years. Current tax amounts are also assumed to not change with the salary range remaining at 2015 levels. Since these assumptions are unrealistic, this is why the data focuses on evidence from the 2016 year with the future predictions giving suggestion to the employment rise in Delhi's future. Furthermore, the research data involving the super-wealthy, being a smaller figure cannot be statistically represented within the data. Since quantitative amounts of tax revenue from the highest earners is implicit, this fact is constituted as suppositional evidence for revenue potential. Exact figures on the specific taxpayer population of Delhi is narrow and therefore is subject to some variability in tax revenue.

6.2.2 Cultural Adversities

During the survey process observations were recorded that in some way influenced the selection preferences of the population. These seemed to manifest in two ways, government perceptions and the language of politics. Like any nation, the culture established today is a culmination of historical events. India is one of the many nations in the world that has lived through years of a government plagued with corruption that has repeatedly mishandled the budget. Many Indians over the years have witnessed a government that has inefficiently spent taxpayer money on bloated department budgets, illegal pocket padding of long-standing politicians and projects that just generally do not reflect the public interest. The past and present misuse of several hundred million in budgetary waste is well known within the country and well reported in the media. The unilateral expression of these sentiments has resulted in Indian citizens being marked with a very high degree of government distrust.

This distrust becomes highly influential when asking a citizen of India how they want the government to spend their taxpayer dollars. When asking them to make a choice weighed against the status quo, you have people taking the survey from two different viewpoints. From the viewpoint of what they *wish* the government would do and the viewpoint what the government *will* do. Participants with the former viewpoint made a choice based on what was written on the cards. Participants with the later viewpoint made a decision based on the government's inability to perform alternative spending scenarios, which often lead to the choice of maintaining the status quo.

The other cultural adversity faced is in regards to language. The average Indian citizen falls generally on the higher-end of political awareness relative to the global sphere. News within India is primarily distributed through English and Hindi language news vehicles. Of the entire population of India, 30% functions primarily in English with more basic knowledge of Hindu or another indigenous language while 70% functions primarily in the latter with a basic knowledge of English. What we find is that the average Indian either learns current events from English news sources or indigene language news sources. Where problems arise is within the vocabulary of Hindi. Post-colonial India did not develop vocabulary for concepts and technology that were introduced during or after this time, instead just borrowing the English word. So when you look at the language of Hindi, words such as bus, taxes, or renewable do not exist in the Hindi language. This creates the problem of translation in two ways. Firstly, the survey conducted could only be presented in English since energy technology and concepts do not translate. Secondly, due to the vocabulary of Hindi, the issues of environmental degradation and pollution exist only in the English speaking political realm of India. There likely exists a connection between language and political desires due to different reports between Hindi and English news. There is also the larger issue that it is difficult for a primarily Hindi speaking individual to make an informed choice in this field. When the dependent variables for an English or Hindi speaking person are held as equal, the language will be a determining factor, which is not a variable in this survey.

6.3 Data Conclusion

The finances for the achievements of the 1980's came heavily from external and internal borrowing. This borrowing contributed to the heavy amount of debt that became a problem in 1991 and led some to have a reserved position towards this internal spending model. The 1980's was the start of wealth accumulation for India making the circumstances for their reforms different from today. Pre-1980 the Indian market began its establishment while today India holds an important place in the global market. The wealth resources of the upper echelon of society were not available in earlier decades narrowing the resources for investment.

The financial security of the population of Delhi has created the financial framework that supports a development tax. Substantial financial revenue, enough to provide opportunities for expanding development and increasing projects exists. This in combination with the current stable economy of India provides a prime foundation for state action. A developmental tax can provide a financial bounty that helps to expedite waste and clean energy investment by providing further relief to an investment burden.

7. Project Recommendations

What we find in Delhi is that implemented technology is subpar and inadequate for a cleaner environment. In the case of Delhi there is the issue that there are not enough implemented projects as of 2015 to install best energy technologies, despite FDI, policy liberalization and development mechanisms like the Clean Development Mechanism of the Kyoto protocol, which provides technology transfer. Delhi needs energy projects that implement higher quality technology for lower ash and greenhouse emissions. They also need more programs in tandem with expanded peri-urban energy, which would help phase out the current pollutant household cooking fuels and increase the use of electricity for everyday household tasks. Lastly, the total waste treatment sector needs to increase its capacity to clean the land and water while also making India more attractive for foreign money. What Delhi needs is for revenue to be diverted into finance for Waste-To-Energy Incineration.

7.1 Waste-To-Energy Incineration

Peri-urban Delhi is marked by a lack of widespread electricity as alternate sources contribute to a large quantity of the energy pollution. All of Delhi is plagued with increasing waste and decreasing storage. It is time for Delhi to move towards incineration. With incineration Delhi can eliminate the large amount of waste that is expected to grow in the country while also using Waste-to-Energy techniques to improve energy security. Delhi could in theory introduce more landfills, however incineration is a more consolidated way of tackling Delhi's energy and storage problems in combination. Waste-To-Energy is currently an underfinanced sector within India with less incentive to entry than other forms of renewable energy and therefore less driven. (Figure 6) shows the MW capacities of all India based on renewable energy variety. As can be seen in this figure, total WTE generation is significantly small compared to total generated solar and wind energy.

Incineration uses the thermal technology that India capitalizes on already so technical knowledge is already partially endowed. Incineration is also less difficult to decommission than a landfill and one of India's problems at this time is lack of

maintenance and proper decommissioning of landfills. This has made landfills stigmatic within Delhi. Current Waste-to-Energy incineration plants are also stigmatic due to the smell and fly-ash from the low technology quality. The smell and fly- ash can easily be

Sector	Cumulative Achievements as of Jan 31st 2016
Grid Interactive Power (Capacity in MW)	
Wind Power	25188.39
Solar Power	5248.21
Small Hydro Power	4187.65
Bio-Power (Biomass, Gasification and Bagasse Generation)	4760.55
Waste to Power	127.08
Total	39511.88
Off-grid/Captive Power (Capacity in MW)	
Waste to Energy	146.51
Biomass(Non-bagasse) Cogeneration	602.37
Biomass Gasifiers Rural	18.15
Biomass Gasifiers Industrial	160.72
Aero Generators/Hybrid Systems	2.67
SPV Systems	302.30
Watermills/ micro hydel	17.21
Total	1249.93

Figure 6: Indian Renewable Energy Mix (Ministry of New and Renewable Energy, 2016)

overcome with improved technology that is already standard grade in the west. The smell is due to the wet composition of India's waste, which as of now has been unsuitable and the wrong grade for handling this waste. The two predominant forms of waste elimination are

stigmatised but there is no choice but for one to be accepted. Since Waste-to-Energy can eliminate waste and introduce cleaner energy, this twofold solution makes incineration the better choice.

Covering high costs for this project type if done properly would be a considerable remedy for Delhi. Delhi produces more TPD MSW than is collected. The landfills currently take in about 6,000 TPD MSW but are reaching capacity (Bloomberg, 2015.) There is currently one operational 1,950 ton per day WTE plant and they are installing two more, one that is 1,300 TPD MSW and one that is 3,000 TPD MSW (DOE, n.d.) These will help handle the excess waste for the landfills, which have reached capacity. More Waste-to-Energy incineration plants, but with improved technology, should be designed and installed to handle excess waste with the expectation that there will be growth in waste generation.

Delhi requires a plant that can handle mixed waste and employs a more efficient design than the current Waste-to-Energy incineration plant in place. Energy created by Waste-to-Energy incineration already produces less ash and greenhouse gas emissions than coal fired plants (ET, 2015,) and with best technology would produce steam and eliminate mixed waste pollution. The culmination of all current sources of waste has contributed significantly to the decline of water quality. A plant with euro-grade technology, which reduces hazardous and non-hazardous fly-ash emissions and has a rotary kiln to handle mixed waste can reduce the extensive pollution. Technology for this endeavor could be supported by technology transfer from investor corporations of fully developed economies. Attracting these investors can be done with increased financial incentive to Waste-to-Energy so that projects provide a positive investment return. This profit feasibility can be calculated when factoring plant design, incentives, taxes, investment incentives, O&M costs and the calorific content of waste.

7.2 Plant and Finance Specifications

A profit and loss statement has been constructed to estimate a feasible small scale Waste-to-Energy plan in Delhi. In finding a Net Present Value above 0 among certain

specifications a plant recommendation can be made. The specifications of this plant will be a 330 ton per day WTE plant with a calorific waste content of 9Mj for solid waste and a minimum of 22Mj for industrial and medical waste with technology for cooling efficiency

WTE Plant Specifications	
MW Capacity	30MW
Tons per Day	330
State Annual Subsidy	0.375% of Delhi Revenue
Capital Plant Costs	36 Million USD
Staff size	100
Cost per Ton Waste	$70
Natural Gas + Grid Fee Price	$39 p/MWh
Electricity Capacity	8MW
Cooling Capacity	12MW
Grant Financing	15 Million USD
Discount Rate	7.25%
Price per KWh Electricity	$0.035 USD
Price per KWh Cooling	$0.05 USD
Waste Handling Varieties	Solid, Medical, Hazardous, Industrial
Solid : Wet Waste Ratio	3 : 1
Plant Type	Rotary Kiln Gasifier CHP

Figure 7: WTE Plant Specifications

and handling mixed waste. Assuming 75% solid waste collection and 25% industrial and medical waste collection, this provides a minimal heat value of 2.9. Inputs for the design are decided by the variables in (figure 7.)

Delhi and India in general are regionally located in warm climates that do not require heating. A cooling system that can convert heat to cool air for desirables like air conditioning is a better design and more suitable for the environment. A cooling system can supply 38% of the MW heat capacity of a plant annually, this data will assume 50% of potential output. In the case of the design of the plant recommendation for Delhi, this would be 35MW annually. The output toward electricity would be 23MW.

Another important feature of this design is the rotary kiln design can handle multiple types of waste and produces only steam. This design accounts for the mixed basket of waste while producing no climate emissions. The schematic for this type of incinerator is shown following in (figure 8):

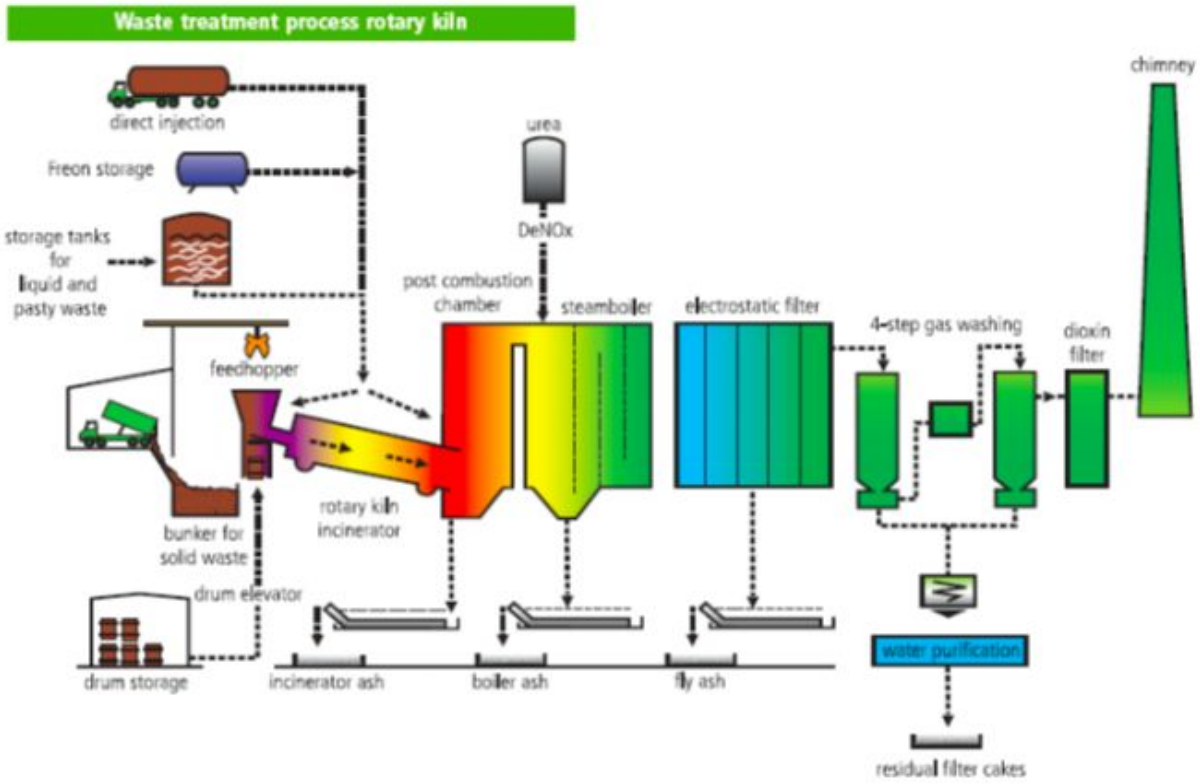


Figure 8: Rotary Kiln Schematic (TNO Science and Industry, 2007)

Shown in the schematic, this type of incinerator is appropriate because of the duel types of waste it handles. Solid waste enters the kiln from below and undergoes firing while from above enters liquid wastes, which enter the kiln and undergo firing at temperatures between 800-1400 degrees centigrade. Since design utilizes the foremost design in wet and dry

waste incineration technology, it can handle the high wet content of Delhi's MSW. Depicted here is a 4-step gas washing process which removes greenhouse gases from the effluent to produce steam; technology that is not in large use in Delhi but required. Since the technology for this plant is more efficient than current Indian technology in place, the water purification system is better equipped to treat the water cycled from the local rivers to prevent the accelerated depreciation of the plant.

Grant financing for innovative new clean technology projects like WTE can be supplied by the National Clean Energy Fund (NCEF, n.d.) This paper will assume a standard grant amount of 30-45% of capital costs towards WTE. This grant would provide the same WTE financial leverage as given to other renewable technologies so that among these WTE can remain competitive. Investors will find this grant financing attractive as it will lower the capital costs for plant investment allowing for higher revenues in the starting period. With higher revenues investors have more free cash flow to operate with. This does not only affect operating cash towards the project with more free cash but it may alleviate any debt or pay back dividends. This incentive makes an investor corporation more attractive and the corporate valuation would increase.

The current growth of solar within India has become increasingly rampant. This is likely due to the fact that solar currently operates in India with little problems, while the technology used up until this point for WTE has been insufficient for an operational clean odorless plant. However, solar unlike WTE does not treat waste. There has been a longstanding wave where renewable energy projects have focused mainly on solar and wind while the dynamics of pollution within Delhi require a new strategy that tackles the two-sides of pollution and the unsustainable negative offshoots.

Accomplishing this is doable and through many of the technology transfer mechanisms under the UNFCCC, Delhi would be able to receive assistance in building a plant to the proper specifications while helping work towards a climate reduction. Through this global partnership in the international political realm lowering emissions and even committing to a small reduction target can be done by India while being provided with the provisions that have been developed for this global action and harmony in the first place.

Technology may also be transferred if corporate investors come from a highly endowed technological country.

Growing the WTE sector using this model can be a positive strategy for Delhi's energy & environment. Having a number of small site specific WTE plants in different areas within the state can minimize complexities with transportation and transmission. By placing plants in various neighborhoods transmission lines would operate more efficiently because of the short distance in delivery. Also collection and disposal at the plant site is easier if there are no logistical complications, which can be caused by having to travel great distances to retrieve waste. It is equally important that sites be located to water bodies for usage by the plants as shown in (figure 9):

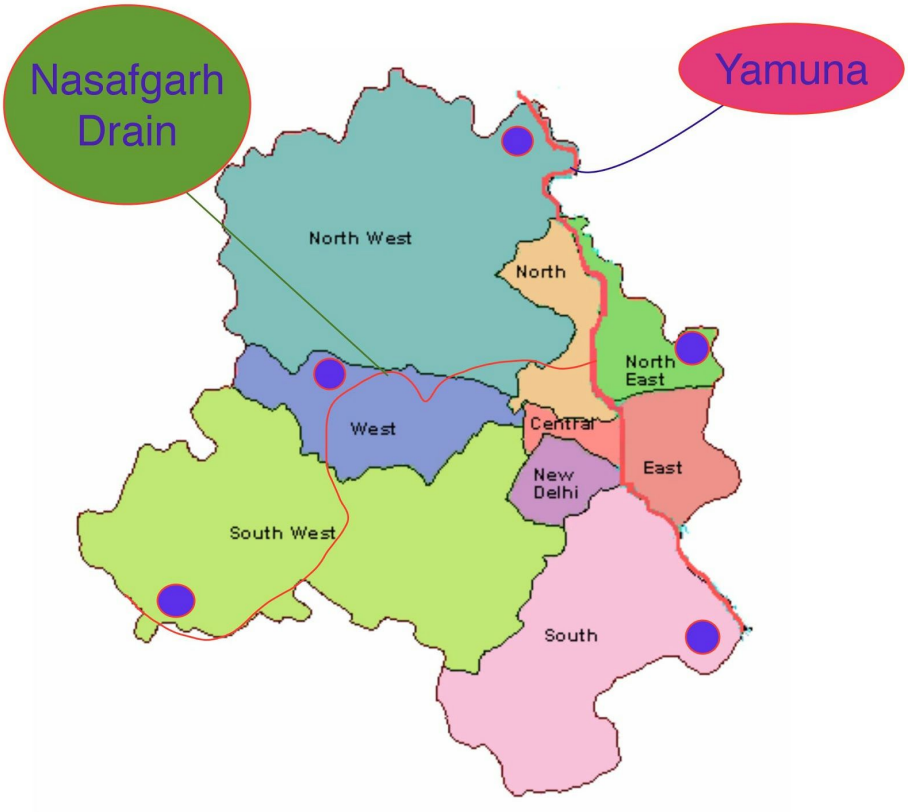


Figure 9: Delhi WTE Strategic Site Locations (Wikimedia Commons, 2008)

As seen, the sites are located out of the highest trafficked regions approaching state perimeters yet remaining at an adequate distance from a water source. Two site locations

are located next to the Nasafgarh Drain, a river that empties into the Yamuna, while the other three are located on the Yamuna itself. People in various neighborhoods and of different economic backgrounds can experience the neighborhood as it transitions to be cleaner and more energy secure through the proper execution of a well constructed and efficient model.

7.3 Profit & Loss and Sensitivity Analysis

Following in appendix A is a sensitivity analysis conducted to show a variety of feasible and infeasible outcomes for this WTE design. Four different sensitivity analyses have been produced for a range of different capital costs. For each of these capital costs the x-axis shows various revenues per ton for waste and the y-axis shows different subsidy percentages ranging in value from 0%-0.5% from external revenue calculated in (table 7) for 2016. The value 0.75% was not included however this value represents the upper value where all CAPEX and waste cost combinations are feasible. The values displayed within the analysis are the Net Present Values for a 30 year period. The negative values in red represent infeasible projects and the positive project values in green are feasible.

As can be seen in appendix A the project design is not feasible without a form of subsidy, however slight increases in revenue provided by subsidy make a large difference in project feasibility.A subsidy through the introduction of a percentage in the range of 0%-0.5% of external finance can provide long-term project feasibility for multiple installments of this plant design. Ensuring that these subsidies are introduced only with specific and state of the art technology, it is recommended these prepackaged projects are offered through project-specific auction with a fixed site location (IRENA, 2015.) For the project and subsidy figure outlayed in appendix B, this equates to an electricity subsidy of $0.0035USD per KWe. This project can be introduced at India's renewable energy auction auction with a fixed rate, which included this subsidized amount. This would embody a similar scheme used to expand solar grid projects within the last five years (MNRE, 2016,) where project designs were auctioned with fixed rates. Offering this project pre-designed

can not only control the amount of plants produced but simplify planning on the side of the bidder.

The profit and loss statement, which can be viewed in appendix B shows a feasible plant based on the aforementioned and supplemental specifications for a WTE plant over a 30 year operational period. An additional specification is an expected 10 year tax free period followed by a 30% corporate tax under Make in India and Indian corporate tax law. Additionally all costs and incomes excluding insurance costs are subject to an annual 2% increase over the 30 year period. Based on selected variables corresponding with a sensitivity analysis, the first projected five years of a profit and loss statement for a feasible WTE plant is displayed. The selected variables chosen that represent a realistic outlook include plant specifications of $4,500USD per KWe CAPEX, $70USD per ton waste with subsidy of 0.375% of revenue for the 2016 year in (table 7.) The culmination of these inputs dispenses a thirty year Net Present Value of $12.8 million USD with a Project Internal Rate of Return of 8.95%. It can be determined that this project is financially feasible and highly recommended as a well suited plant model for Delhi. It is further recommended that funds from the external revenue source be used towards not only multiple project funding, but tandem programs as outlined in the project stipulations.

7.4 Project Stipulations

As patterns move away from landfills towards incineration, the recycling initiatives of the slums should not become compromised; slum residents being the main landfill pickers and materials recyclers for the state. The current conditions of landfill picking are not ideal for the health of the pickers but their routine can be incorporated into the waste collection system that not only improves the system but their safety as well. If picking occurred at the plant this would be time efficient and would impose a healthier environment for the workers, pickers who no longer would need to scavenge the landfills. With on-site sorting at the incineration plant the recycling effort would be reinforced and enlarged, the current pickers would maintain their important recycling roles and earn more while creating employment for those hired to collect the waste and bring it to incineration.

It is important to keep in mind the labor implications of altering the current growth model. There should not be job replacements but job expansion, especially when tactically trying to close the wealth gap. Shrinking the wealth gap does not only include taxation on higher incomes, but a financial plan means smartly investing in national growth. Particularly, when investing in the expansion of the waste treatment sector, this creates opportunity at the lateral employment level. When the right amount of investment is routed not only to corporate growth but state development, this institutes a balance that better supports the economic ecosystem.

Within policy more programs should be developed that assist WTE project facilitation and shape the state to be in better tune with the new projects. Currently the LPG subsidy program has been the singular program to try and switch people over from dung to gas cooking. There have been issues with the execution of this program due to corruption and legalities. (GSI, 2015) A new program that works to switch consumers over to electrical energy for household tasks could learn from the lessons of the LPG program and implement an improved design. Switching to electric is also a one-time affair and therefore provides a more convenient and better product to the consumer versus monthly travel and carry of an LPG tank.

There are also jobs within Delhi that currently exist due to the use of dung cooking. These positions include dung farmers and transporters. When the need for these positions becomes obsolete it is important that preference be shown to these individuals for remaining employed. Current dung transporters, which are already familiar with the routes of their localities can be trained and used in the transportation of waste. Dung farmers should be given the given assistance and training to alter the usage of dung away from energy and towards new market opportunities for their product. They can also be trained to work as ranchers diverting cow traffic caused by the rampant cow population within India which has historically impaired transport and logistics.

8. Conclusion

How development has been defined in the world overlooks the imminent and abundant availability of environmental resources. Commerce, education, security all develop a nation but it must be recognized that environmental damage is a side effect that diminishes a nation's holistic and monetary value. Ignoring the eventual cost of damages is not a short nor long-term solution. Following the current 'business-as-usual model,' a current model which does not promulgate class equality or sustainability, cannot eradicate poverty nor protect all life. Furthermore, issues of political sovereignty would be more intact if they had greater internal financial measures to promote clean energy security and growth. These measures cannot only increase jobs which chain react growth but protect the natural resources available, which equally sustain a system.

The issues of environmental degradation and how health and human well-being is affected in principle requires action as preserving life is a fundamental for the future. Growth and resource extinction are mutually exclusive and this principle must be incorporated for long-term development. Counteracting the current negative externalities should be incorporated into the immediate mission of the India's future. Since coal energy is expected to grow at a faster rate than renewables, the current energy sector design will continue to harm air quality. This will in turn hurt the labor population as more skilled laborers may emigrate as the situation degrades or as health declines becomes less productive and expensive to care for.

Unsubstantiated apprehensions in imposing international climate mandates has allowed financially endowed countries from committing to climate reductions. The finance that can be sourced can increase investment within an economy while not detracting from finance towards important socio-economic sectors e.g. education. National and international policy can equally require for high emitting nations to scale down their contributions to land, sea and air pollution, especially when the converse inhibits sustainable growth. Readdressing historical politics based on new data can initiate a new era of international developmental policy.

Upon acceptance of the ability of India to have a hand in guiding their own sustainable development, the national initiative of financing high-end Waste-to-Energy incineration projects and power generation in Delhi through subsidy from income taxation should be put forth. The benefits of internal and external financing towards development projects can strike a balance which brings about an increase in positive outcomes over the business-as-usual model. This alternative developmental-economic strategy incorporates sustainability by better encompassing principles three and five of the Rio Declaration. This helps neutralize developmental threats and bridges inequality while posing no financial injury to the salaried population. Sustainable development in large lower-middle income economies can be attained through a delicate strategy of internal and external finance versus historical singular strategies of one or the other. This can sustainably transition economies and strengthen their sovereignty faster than that of the current rate.

Expanding waste disposal in Delhi would increase fixed employment. Ongoing operational duties are sectors of non-term employment that can grow the economy at a constant. The construction of an incineration plant can also offer term employment, typically at a two year interval for this type of project. This would strengthen the country as jobs would not only lift a portion of the population out of their low income status, but create spending power that can drive the economy as a whole.

Enhancing investment and technology transfer to shape a new face for Waste-to-Energy in India through a wealth financed subsidy can bridge wealth inequality and lower pollution. The technology that Delhi currently needs to eradicate the extensive pollution is not yet in place. Attracting and financing this technology must be a priority and the importance of subsidies towards development projects in renewable technology is substantial. Furthermore, when the project is profitable everyone gains. Using otherwise non-invested finance from the financially endowed taxable population can be a catalyst for wealth not to trickle down but strategic wealth creation. It is important to remember that development spending is like any other investment for national growth and does not hinder growth despite unfounded political argumentation. Using income tax dollars from wealthy

individuals which would have otherwise not been invested can incentivize finance for more projects which increase jobs and thereafter increases spending and growth.

One principle that has not been addressed is the principle of democratic governance. This is important during national decision making since within democracies like India the government's supreme function is to fulfill the desires of the people. If a majority of the people want to see improved health, environment and energy and want to contribute from their salaries to see these outcomes, than it is their right under a democracy to see this performance carried out by the government. Despite current political strategy, civilians want to see a new era of sustainability and policy. Sustainability is about prolonging life, energy and jobs to enhance existence and survival for present and future generations. When these human requisites are threatened and in themselves urge change, a new course illuminated by the people shows policymakers what path to follow.

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Appendix A

Sensitivity Analysis 1

			% of Revenue Subsidy				
CAPEX per Kwe	$	3,500.00	0%	0.125%	0.25%	0.375%	0.5%
Costs of Waste per Ton	$	10.00	$ (37,656,477.00)	$ (25,272,931.00)	$ (12,889,384.00)	$ (505,837.00)	$ 11,877,710.00
	$	20.00	$ (34,216,296.00)	$ (21,832,749.00)	$ (9,449,202.00)	$ 2,934,345.00	$ 15,317,892.00
	$	30.00	$ (30,776,115.00)	$ (18,392,568.00)	$ (6,009,021.00)	$ 6,374,526.00	$ 18,758,073.00
	$	40.00	$ (27,335,933.00)	$ (14,952,386.00)	$ (2,568,839.00)	$ 9,814,708.00	$ 22,198,255.00
	$	50.00	$ (23,895,752.00)	$ (11,512,205.00)	$ 871,342.00	$ 13,254,889.00	$ 25,638,436.00
	$	60.00	$ (20,455,570.00)	$ (8,072,023.00)	$ 4,311,524.00	$ 16,695,071.00	$ 29,078,618.00
	$	70.00	$ (17,015,389.00)	$ (4,631,842.00)	$ 7,751,705.00	$ 20,135,252.00	$ 32,518,799.00
	$	80.00	$ (13,575,207.00)	$ (1,191,660.00)	$ 11,191,887.00	$ 23,575,434.00	$ 35,958,981.00
	$	90.00	$ (10,135,026.00)	$ 2,248,521.00	$ 14,632,068.00	$ 27,015,615.00	$ 39,399,162.00
	$	100.00	$ (6,694,844.00)	$ 5,688,703.00	$ 18,072,250.00	$ 30,455,797.00	$ 42,839,344.00

Sensitivity Analysis 2

			% of Revenue Subsidy				
CAPEX per Kwe	$	4,500.00	0%	0.125%	0.25%	0.375%	0.5%
Costs of Waste per Ton	$	10.00	$ (44,963,914.00)	$ (32,580,367.00)	$ (20,196,820.00)	$ (7,813,273.00)	$ 4,570,274.00
	$	20.00	$ (41,523,733.00)	$ (29,140,186.00)	$ (16,756,739.00)	$ (4,373,092.00)	$ 8,010,455.00
	$	30.00	$ (38,083,551.00)	$ (25,700,004.00)	$ (13,316,457.00)	$ (932,910.00)	$ 11,450,637.00
	$	40.00	$ (34,343,670.00)	$ (22,259,823.00)	$ (9,876,276.00)	$ 2,507,271.00	$ 14,890,818.00
	$	50.00	$ (31,203,188.00)	$ (18,819,641.00)	$ (6,436,094.00)	$ 5,947,453.00	$ 18,331,000.00
	$	60.00	$ (27,763,007.00)	$ (15,379,460.00)	$ (2,995,913.00)	$ 9,387,634.00	$ 21,771,181.00
	$	70.00	$ (24,322,825.00)	$ (11,939,278.00)	$ 444,269.00	$ 12,827,816.00	$ 25,211,633.00
	$	80.00	$ (20,822,644.00)	$ (8,499,097.00)	$ 3,384,450.00	$ 16,267,997.00	$ 28,651,544.00
	$	90.00	$ (17,422,462.00)	$ (5,058,915.00)	$ 7,324,632.00	$ 19,708,179.00	$ 32,091,725.00
	$	100.00	$ (14,002,281.00)	$ (1,618,734.00)	$ 10,764,813.00	$ 23,148,360.00	$ 35,531,907.00

Sensitivity Analysis 3

			% of Revenue Subsidy				
CAPEX per Kwe	$	5,500.00	0%	0.125%	0.25%	0.375%	0.5%
Costs of Waste per	$	10.00	$ (52,271,351.00)	$ (39,887,804.00)	$ (27,504,257.00)	$ (15,120,710.00)	$ (2,737,163.00)
	$	20.00	$ (48,831,169.00)	$ (36,447,622.00)	$ (24,064,075.00)	$ (11,680,528.00)	$ 703,019.00
	$	30.00	$ (45,390,988.00)	$ (33,007,441.00)	$ (20,623,894.00)	$ (8,240,347.00)	$ 4,143,200.00
	$	40.00	$ (41,950,806.00)	$ (29,567,259.00)	$ (17,183,712.00)	$ (4,800,165.00)	$ 7,583,382.00
	$	50.00	$ (38,510,625.00)	$ (26,127,078.00)	$ (13,743,531.00)	$ (1,359,184.00)	$ 11,023,563.00
	$	60.00	$ (35,070,433.00)	$ (22,686,896.00)	$ (10,303,349.00)	$ 2,080,198.00	$ 14,463,745.00
	$	70.00	$ (31,630,262.00)	$ (19,246,715.00)	$ (6,863,168.00)	$ 5,520,379.00	$ 17,903,926.00
	$	80.00	$ (28,190,080.00)	$ (15,806,533.00)	$ (3,422,986.00)	$ 8,960,561.00	$ 21,344,107.00
	$	90.00	$ (24,749,899.00)	$ (12,366,352.00)	$ 17,195.00	$ 12,400,742.00	$ 24,784,289.00
	$	100.00	$ (21,309,717.00)	$ (8,926,170.00)	$ 3,457,377.00	$ 15,840,923.00	$ 28,224,470.00

Sensitivity Analysis 4

			% of Revenue Subsidy				
CAPEX per Kwe	$	6,500.00	0%	0.125%	0.25%	0.375%	0.5%
Costs of Waste per	$	10.00	$ (59,578,787.00)	$ (47,195,240.00)	$ (34,811,693.00)	$ (22,428,146.00)	$ (10,044,499.00)
	$	20.00	$ (56,138,606.00)	$ (43,755,059.00)	$ (31,371,512.00)	$ (18,987,965.00)	$ (6,604,418.00)
	$	30.00	$ (52,698,424.00)	$ (40,314,877.00)	$ (29,931,330.00)	$ (15,547,783.00)	$ (3,164,236.00)
	$	40.00	$ (49,258,243.00)	$ (36,874,396.00)	$ (24,491,149.00)	$ (12,107,602.00)	$ 275,945.00
	$	50.00	$ (45,818,061.00)	$ (33,434,514.00)	$ (21,050,967.00)	$ (8,667,420.00)	$ 3,716,127.00
	$	60.00	$ (42,377,880.00)	$ (29,994,333.00)	$ (17,610,786.00)	$ (5,227,239.00)	$ 7,156,308.00
	$	70.00	$ (38,937,698.00)	$ (26,554,151.00)	$ (14,170,604.00)	$ (1,787,058.00)	$ 10,596,489.00
	$	80.00	$ (35,497,517.00)	$ (23,113,970.00)	$ (10,730,423.00)	$ 1,653,124.00	$ 14,036,671.00
	$	90.00	$ (32,057,335.00)	$ (19,673,788.00)	$ (7,290,242.00)	$ 5,093,305.00	$ 17,476,852.00
	$	100.00	$ (28,617,154.00)	$ (16,233,607.00)	$ (3,850,060.00)	$ 8,533,487.00	$ 20,917,034.00

Appendix B

Business Model (P&L Statement)

Project name	Corporate Subsidized Best WTE Technology
Location	Delhi
Short project description	Small-scale Multi-Variate Waste Incineration Plant - 30MW

Valuation Year	**2016**

Amounts in $	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Revenue 1 - Electricity [8MW , .036 cent USD per KWh]		$ 2,185,920	$ 2,229,638	$ 2,274,231	$ 2,319,716	$ 2,366,110
Revenue 2 - Municipal Waste [30MW per yr * 8,000, $70 USD per ton]		$ 1,911,687	$ 1,949,920	$ 1,988,919	$ 2,028,697	$ 2,069,271
Revenue 3 - Cooling Energy [12 MW , .05 cent USD per KWh, 50% potential]		$ 2,310,000	$ 2,356,200	$ 2,403,324	$ 2,451,390	$ 2,500,418
Revenue 4 - Annual Subsidy, 0.5% of External Tax Revenue		$ 209,622	$ 251,546	$ 301,856	$ 362,227	$ 434,672
Revenues	**$ -**	**$ 6,617,229**	**$ 6,787,305**	**$ 6,968,330**	**$ 7,162,030**	**$ 7,370,472**
Raw material costs 1 - Natural Gas + Grid Fees [40,000MWh per yr , $39 USD per MWh]		$ (1,544,400)	$ (1,575,288)	$ (1,606,794)	$ (1,638,930)	$ (1,671,708)
Raw material costs 2 - Electrical Self Demand [10% of 8MWh * 8,000 , $36 USD per MWh]		$ (218,592)	$ (222,964)	$ (227,423)	$ (231,972)	$ (236,611)
Raw Materials	**$ -**	**$ (1,762,992)**	**$ (1,798,252)**	**$ (1,834,217)**	**$ (1,870,901)**	**$ (1,908,319)**
Personell costs [5 rotations, 20 per rotation, $8,500 USD per annum]		$ (850,000)	$ (867,000)	$ (884,340)	$ (902,027)	$ (920,067)
Maintenance costs [2% of CAPEX]			$ (3,121,200)	$ (3,183,624)	$ (3,247,296)	$ (3,312,242)
Insurance costs [0.5% of CAPEX]		$ (78,030)	$ (79,591)	$ (81,182)	$ (82,806)	$ (84,462)
Deashing [5% * total waste in tons * $0.45 USD]		$ (204,188)	$ (208,271)	$ (212,355)	$ (216,520)	$ (220,768)
O&M (operation and maintenance)	**$ -**	**$ (1,132,218)**	**$ (4,276,062)**	**$ (4,361,501)**	**$ (4,448,650)**	**$ (4,537,539)**
EBITDA	**$ -**	**$ 3,722,019**	**$ 712,991**	**$ 772,611**	**$ 842,479**	**$ 924,613**
Depreciations			$ (1,800,000)	$ (1,800,000)	$ (1,800,000)	$ (1,800,000)
EBIT	**$ -**	**$ 3,722,019**	**$ (1,087,009)**	**$ (1,027,389)**	**$ (957,521)**	**$ (875,387)**
Corporate Tax, 10 yr tax free, 30% corporate tax	$ -	$ -	$ -	$ -	$ -	$ -
NOPAT net operating profit after tax	**$ -**	**$ 3,722,019**	**$ (1,087,009)**	**$ (1,027,389)**	**$ (957,521)**	**$ (875,387)**
Depreciations			$ 1,800,000	$ 1,800,000	$ 1,800,000	$ 1,800,000
Operating Cash Flow	**$ -**	**$ 3,722,019**	**$ 712,991**	**$ 772,611**	**$ 842,479**	**$ 924,613**
CAPEX [$4,500 USD per kwe]	$ (36,000,000)					
FCF (Free Cash Flow)	**$ (36,000,000)**	**$ 3,722,019**	**$ 712,991**	**$ 772,611**	**$ 842,479**	**$ 924,613**
Grant financing, NCEF	$ 15,000,000					
Taxes on grant financing		$ 86,250	$ 86,250	$ 86,250	$ 86,250	$ 86,250
FCF (Free Cash Flow) nach Förd. WKLG	**$ (21,000,000)**	**$ 3,808,269**	**$ 799,241**	**$ 858,861**	**$ 928,729**	**$ 1,010,863**

Discount Rate	**in %** 7.25%
NPV 30 year	**in $** $ 12,827,816
Project IRR 30 years	**in %** 8.95%

orm:
Assumed Average Discount Rate India